NATIONAL
FRUIT AND CIDER INSTITUTE,
LONG ASHTON,
NEAR BRISTOL.

REPORT
FOR THE YEAR
1908.

BATH:
PRINTED BY WILLIAM LEWIS & SON, 12, NORTH GATE.

The National Fruit and Cider Institute

LONG ASHTON, NEAR BRISTOL.

REPORT OF THE GOVERNORS

To the Sixth General Meeting of Governors, Members and Associates, to be held in the Council Pavilion of the Bath and West and Southern Counties Society, Show Yard, Dorchester, on FRIDAY, May 28th, 1909, at 2.15 p.m.

Governors of the Institute:

ACLAND, Sir C.T. DYKE-, Bart. (Chairman)
BAKER, G. E. LLOYD-
BIFFEN, R. H.
BUNYARD, G.
COOKE, C. W. RADCLIFFE-
DAVIS, HERBERT J.
DYSON, GIBSON.
ELLIOTT, Sir THOMAS, K.C.B.
GIBBONS, H. H.
GRANT, W. J.
GRENVILLE, R. NEVILLE-
HOBHOUSE, RIGHT HONOURABLE H.
HUNT, A. E. BROOKE-
MATTHEWS, HENRY
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NASH, HERBERT
OSBOURNE, J. S. SMYTH-
RILEY, JOHN
SHELLEY, Sir JOHN, Bart.
SILLIFANT, A. O.
SLATTER, JAMES
SMITH, J. W.
WATTS, JAMES
WHEELER, E. VINCENT V.
WOOTTON, JOHN H.

Managing Committee:

NAPIER, H. B. (Chairman)
COOKE, C. W. RADCLIFFE-
GRENVILLE, R. NEVILLE-
HUNT, A. E. BROOKE-
OSBOURNE, J. S. SMYTH-
SLATTER, JAMES.
WATTS, JAMES

Members:

ACLAND, Sir C. T. D., Bart. Killerton, Exeter.
AMORY, LUDOVIC H. Knightshayes Court, Tiverton.

BAKER, G. E. LLOYD-. Hardwicke Court, Gloucester.
BERKELEY HUNT AGRICULTURAL SOCIETY. Berkeley, Gloucester.
BIFFEN, R. H. The Gables, Histon, Cambridge.
BOND, E. W. Hele, Cullompton, Devon.
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BRISTOL & DISTRICT MARKET GARDENERS' ASSOCIATION. The Grove, Fishponds, Bristol.

Members *(continued).*

Bulmer, E. F. Ryelands, Hereford.
Bulmer, H. P. Ryelands, Hereford.
Bunyard, G. Royal Nurseries, Maidstone.
Butler, Chas. (M.D.) Syon House, East Budleigh, Devon.

Caddick, E. W. Caradoc, Ross, Hereford.
Carew, C. E. Pole-. Parkhill, Littlehempston, Totnes.
Chapman, G. F. Draycott, Somerset.
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Childs, Christopher. Boscarn, Love, R.S.O., Cornwall.
Cooke, C. W. Radcliffe-. Hellens, Dymock, Gloucester.
Coutts, H. Burdett Money. Stoodleigh Court, Tiverton.
Crawshay, Captain F. W. Hempnall House, Hempnall, Norfolk.
Crossman, Henry. Ham Farm, Yatton, Somerset.

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Davis, Herbert J. Hurlingpot, Shepton Mallet.
Dowden, J. Mostyn. Messrs. Dowden & Pook, 41, Bermondsey Square, London.
Drew, Wm. Bishopsteignton, Devon.
Durham, H. E. (Dr). Clovelly, Tower Road, Hereford.
Dyson, Gibson. Brockhall, Leominster.

Edgell, Herbert. 42, Hanway Street, Oxford Street, London, W.
Elliott, Sir Thomas H., K.C.B. Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.
Ellis, Henry Arthur. Highman, Gloucester.

Farwell, E. W. 11, Laura Place, Bath.
Fletcher, E. Hazeldine, Rydes Hill, near Guildford.

Gaymer & Son, Ltd. Attleborough, Northampton.
Gibbons, H. H. Church Farm, Clutton, Bristol.
Goodall, The Revd. R. W. Kempley Vicarage, Dymock, Gloucester.
Grant, W. J. County Council Offices, Newport.
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Grew, James. Co. Armagh Cider Co., Portadown, Ireland.

Haydon, H. Courtenay. Chettiscombe, Tiverton, Devon.
Hill, E. H. Broadwas Court, Worcester.
Hinckes, R. T. Foxley, Hereford.
Hobhouse, Rt. Hon. H. Hadspen House, Castle Cary, Somerset.
Hunt, A. E. Brooke-. Board of Agriculture and Fisheries, 21, St. James's Square, London, S.W.

Jeffrey, Robert. The Throsk, Succoth Place, Murrayfield.
Jones, Joseph. Coton House, Wolverhampton.

Keel, Walter W. Stanton Drew, Bristol.
Kelly, Major. Woolston, North Cadbury, Somerset.

Lloyd, F. J. Muscovy House, Trinity Square, London, E.C.

Mann, Felix. 127, Fenchurch Street, London, E.C.
Marshall, L. H. Chippenham, Wilts.
Matthews, Henry. Winterbourne, Bristol.
Mid-Somerset Agricultural Society. Shepton Mallet.
Mole, H. B. Shepton Mallet, Somerset.
Monmouthshire Chamber of Agriculture. Newport.
Morris, Mrs. Lizzie. 147, Harley Street, London.

Napier, H. B. Estate Office, Long Ashton, Bristol.
North Somerset Agricultural Society (F. W. Hunt). 26, Nicholas Street, Bristol.

Members *(continued).*

Osborn, C. Woolston, North Cadbury, Somerset.
Osbourne, J. S. Smyth-. Ash, Iddesleigh, N. Devon.

Pickering, P. S. M. Woolacombe, Devon.
Porter, W. J. H. Glendale Farm, Wedmore, Somerset.
Power, Thomas. Dungarvan, Waterford, Ireland.
Preece, Thomas. Old Hall, Ross, Hereford.
Price, M. Philip. Tibberton Court, Gloucestershire.
Pulling and Company. Bath Street, Hereford.

Rich, M. W. Sandford, Bristol.
Ricketts, E. E. Cape Hall Farm, Stonehouse, Gloucester.
Riley, John. Putley Court, Ledbury.
Royal Jersey Agricultural Society. Jersey.
Ruck, G. A. The Copse, Shiplett, Weston-super-Mare.

Shelley, Sir John, Bart. Shobrooke Park, Crediton, Devon.
Sherston, Major C. D. Evercreech, Bath.
Sillifant, A. O. Culm Leigh, Stoke Canon, Exeter.
Slatter, James. Paxford, Campden, Gloucester.
Smith, J. W. Thinghill Court, Hereford.
Stewart, J. Finlay. Aish Cross House, near Totnes, Devon.
Somerset County Agricultural Association. Taunton.
Stooke, J. E. Hellyar. 2, Palace Yard, Hereford.
Studdy, T. Upper Bordean, Petersfield, Hants.
Sutton, Leonard G. Hillside, Reading.

Taunton Deane Horticultural and Floricultural Society. Taunton Deane, Somerset.
Thomas, Lieut.-Col. Aubrey. Overross, Hereford.
Till, E. D. The Priory, Eynsford, Kent.
Tilley, L. H. Banham, near Attleborough, Norfolk.
Tilley, W. T. S. East Compton, Shepton Mallet.

Vandeleur, Thos. P. Par Station, Cornwall.
Vine Products Co., Ltd. V. P. Winery, Oil Mill Lane, Kingston-on-Thames.

Walker, E G. F. The Hollies, Chewstoke, Bristol.
Walkey, C. E. J. Edgeborough, Staplegrove, Taunton.
Wallis, W. Tewkesbury, Gloucester.
Wardlaw, H. Holway Farm, Sherborne, Dorset.
Warren, Richard, A. Belle Vue, Harrow Road, Worcester.
Watts, James. Backwell, near Bristol.
Wheeler, E. Vincent V. Newnham Court, Tenbury, Worcestershire.
Whiteway, Henry. Fordron House, Whimple, Devon.
Williams, T. W. Bank Chambers, Corn Street, Bristol.
Wilson & Co., Ltd. Frome, Somerset.
Wootton, John H. Byford, Hereford.

Associates:

Allen, J. D. Springfield, Shepton Mallet.
Allison, J. B. Rock Villa, Burrowbridge, Bridgwater.

Batten, George. Rosebank, Pensford, Bristol.
Bell, F. A. Wellow House, Wellow, Newark.
Bird, William. The Nest, Overndale Road, Fishponds, Bristol.
Britten, J. E. Old Wood, Tenbury, Worcester.
Brook, Charles. Marksbury, Somerset.

Carter, Frederick J. Failand Farm, Failand, Bristol.
Cazalet, R. H. The Bannut Tree House, Castlemorton, Malvern, Worcester.

Associates *(continued).*

CHAPMAN, WALTER. Hewish, Bristol.
COCKS, A. H. Poynetts, Skirmett, near Henley-on-Thames, Oxon.
CROFTS, JOHN. Sutton Montis, Sparkford, Somerset.

DE GOOSH, ARTHUR W. Kimball Buildings, 18, Tremont Street, Boston, U.S.A.

GILES, JOHN. Portbury, Bristol.

HUNT, WALTER. Easton-in-Gordam, Somerset.

JONES, GEORGE. Wood Farm, Welland, Malvern.

LAIGHT, HUBERT. Kempley, Dymock, Gloucester.
LANGFORD, E. W. Wyebridge Stores, Hereford.

MCCREATH, W. D. Quantock Vale Cider Works, North Petherton, Bridgwater.

PIKE, CHRISTOPHER B. 10, Eglinton Park, Kingstown, Dublin.
PLAYER, E. N. 60, Alma Road, Clifton, Bristol.
POPE, JOHN M. Spence Combe, Copplestone, Devon.
POWELL, Mrs. A. Hall Court, Much Marcle, Hereford.
PRETTY, W. H. 4, The Terrace, Shirehampton, Bristol.

REID, HUGH. Long Ashton, Bristol.
RIDLER, R. E. Clehonger Manor, Hereford.
RIPLEY, E. G. Beaston House, Bucknall, Shropshire.

STONE, THOS. Wine and Cider Merchant, Axminster.
SYMES, J. H. Coat Farm, Martock, Somerset.
SUTTON, WILLIAM LINCOLNE. Eaton, Norwich.

TAVENER, GEORGE E. Budlake, Broadclyst, Devon.
THOMPSON, ERNEST H. Gilmorton, Tenbury, Worcester.
TUCKETT, PHILIP D. Netherton, near Newton Abbott.
TUDWAY, C. C. Wells, Somerset.
TURNER, WM. Heath Barton, Pinhoe, Exeter.

WALLER, J. A. Pen Park, Westbury-on-Trym, Bristol.
WARREN, CYPRIAN A. 8, Lichfield Gardens, Richmond, Surrey.
WESTON, HENRY. Bounds Farm, Much Marcle, Hereford.

YELLAND, W. D. Nethercot, Iddesleigh, Devon.

Resident Director:

B. T. P. BARKER, M.A. The National Fruit and Cider Institute, Long Ashton, Bristol.

Superintendent of Fruit Department:

J ETTLE, F.R.H.S. Stanley Grove Road, Weston-super-Mare.

Hon. Treasurer:

H. B. NAPIER. Estate Office, Long Ashton, Bristol.

Hon. Secretary:

W. J. GRANT. County Council Offices, Pentonville, Newport, Mon.

REPORT BY THE GOVERNORS.

1. The Governors beg to submit to the Members the following Report on the work of the Institute during the past year.

2. The Institute has been founded and is maintained by the following Bodies :—

The Board of Agriculture and Fisheries.
The Bath and West and Southern Counties Society.
Devon County Council.
Gloucester County Council.
Hereford County Council.
Monmouth County Council.
Somerset County Council.
Worcestershire County Council.

3. Since the formation of the Institute, new Members and Associates have been enrolled each year, and the Governors hope that as the work and objects of the Institute become more widely known there will be a steady increase in the number of both Members and Associates. Members and Associates.

4. In accordance with Article 30 of the Articles of Association, the following Governors retire :—

Governors.	By whom appointed.
Sir C. T. Dyke-Acland, Bart.	Bath and West Society.
Sir Thomas H. Elliott, K.C.B.	Board of Agriculture.
Mr. G. Bunyard	Royal Horticultural Society.
Mr. A. O. Sillifant	Devon County Council.
Mr. Henry Matthews	Gloucester County Council.
Mr. W. J. Grant	Monmouthshire County Council.
Mr. Herbert Nash	University College, Bristol.
Mr. R. H. Biffen	University of Cambridge.

These Governors are eligible for re-nomination by the various bodies whom they represent.

5. The Governors and Managing Committee wish to impress upon the Counties concerned, and upon all persons interested in the important industry of Cider-making the advantages of the opportunity now placed at their disposal, Advantages of Institute.

through the formation of the Institute, by means of which they may obtain advice and assistance bearing upon this industry, either by personally visiting the Institute, or by sending their sons there to receive instruction, scientific and practical, not only in Cider and Perry-making, but also in the growth of fruit and the production of fruit trees.

Terms

6. Students can be received on the following terms :—

Scientific instruction in the Laboratory :—
Four guineas for one month's instruction ; or
Ten guineas for three months' instruction.

Working pupils from subscribing Counties can be received at the Institute for a period of not less than one year for instruction upon Fruit-growing, and to work upon the Farm. Pupils to receive a wage of 7s. 6d. per week from the Institute, the Counties sending the pupils to contribute a Scholarship of £20 per annum.

University College, Bristol.

7. In addition to the advantages already mentioned, arrangements were made two years ago with the University College of Bristol for a conjoint course of instruction in Fruit-growing and Cider-making (including research on Cider ferments) to which the interested bodies and counties are entitled to send one student free of charge for this special course.

Distribution of Cider Apple and Perry Pear Trees.

8. The complete number of trees distributed during this season (1908) for the purpose of establishing, what might be termed, the best examples of Cider and Perry Orchards in the cider producing counties is as follows :—

Devon County Council	.. 224
Gloucester County Council ..	.. 300
Hereford County Council ..	.. 300
Monmouth County Council ..	.. 300
Somerset County Council ..	.. 300
Worcester County Council ..	.. 300
Board of Agriculture	.. 225
Bath and West Society ..	.. 210
Members	..1018
	3177

Practical Work.

9. In October and November, 1908, the Cider-making months, a large number of all those interested in the West

country industry of Cider-making from the counties of Devon, Gloucester, Hereford, Monmouth, Somerset, and Worcester availed themselves of the opportunity of visiting the Institute.

Inspection of Institute, Nursery and Fruit Plantation.

10. Since the last report the Institute has been inspected by those who are interested both in the Cider industry and Fruit Culture from many counties, all of whom seemed to be thoroughly impressed with the very practical and thorough manner in which the making of Cider was carried out, and also in the production of the best Cider Apples and Perry Pears, which are being grown in the Nursery attached to the Institute.

Object Lesson

11. With a view of extending the usefulness of the Institute, arrangements were made by which exhibits from an educational standpoint were sent to—

Bath and West and Southern Counties Society, Newport.
Berkeley Hunt Agricultural Society's Show.
Brewers' Exhibition, London.
Devon County Show.
Hereford and Worcester Agricultural Society's Show.
Mid-Somerset Agricultural Society's Show.
Somerset County Agricultural Society's Show.
East Somerset Agricultural Society.
Taunton Deane Horticultural Society.
Gloucester Agricultural Society.
Backwell Apple Show.
Hereford County Council Exhibition.

Tasting Cider and Perry.

12. A thoroughly representative, and certainly the largest, gathering that has yet taken place at the Institute, met on Thursday, 6th May, 1909, for the purpose of inspecting the Fruit plantations, seeing the work that was being done, and tasting the Cider and Perry made from Fruit grown in the various Cider counties.

Mr. Barker, as on previous occasions after the tasting, gave to an interested audience an object lesson of considerable value on the various yeasts that are desirable or otherwise in the successful fermentation of Cider or Perry; in this way the Visitors had an excellent opportunity of forming some ideas as to the value and necessity of the research work that was being carried out at the Institute.

13. The Governors take this opportunity of requesting all who are either interested in the Institute or in the work it is

doing, to use their influence in urging others to become Members. Members' subscriptions are one guinea per annum, for which they receive all the literature published by the Institute, and can have either six varieties of Apples or Pears or six kinds of Cider or Perry analysed each year. Associates have the same privileges, with the exception that they are unable to vote at the Annual Meeting; while both Members and Associates can visit the Institute and obtain advice from Mr. B. T. P. Barker, upon all matters in connection with the Cider industry.

14. In the Appendix will be found a reprint from the last "Journal" of the Bath and West and Southern Counties Society, containing Reports upon the National Fruit and Cider Institute, from Messrs. B. T. P. Barker and J. Ettle.

W. J. GRANT,
Hon. Sec.

THE NATIONAL FRUIT AND CIDER INSTITUTE.

CASH ACCOUNT FOR THE YEAR 1908.

	£ s. d.	£ s. d.
To GRANTS—		
Board of Agriculture	300 0 0	
Bath and West of England Society	100 0 0	
Devon County Council	100 0 0	
Gloucester County Council	100 0 0	
Hereford County Council	100 0 0	
Monmouth County Council	50 0 0	
Somerset County Council	100 0 0	
Worcester County Council	100 0 0	
		950 0 0
To AFFILIATION FEES.		
Bristol University College	1 1 0	
Bristol and District Gardeners' Association	1 1 0	
Berkeley Hunt Agricultural Society	1 1 0	
Brewers' Exhibition	1 1 0	
Mid-Somerset Agricultural Society	1 1 0	
Monmouth Chamber of Agriculture	1 1 0	
North Somerset Agricultural Society	1 1 0	
Royal Jersey Agricultural Society	1 1 0	
Somerset Agricultural Society	1 1 0	
Taunton Deane Agricultural Society	2 2 0	
		11 11 0
To MEMBERS' SUBSCRIPTIONS		69 6 0
To ASSOCIATES' SUBSCRIPTIONS		7 0 0
To SALES		291 1 10
To MISCELLANEOUS—		
Devon Show, towards Expenses	2 2 0	
Lady Smyth, towards Pruning	50 0 0	
G.W. Railway, for damage to Show Goods	0 17 6	
		52 19 6
Balance due to Bank 31st December, 1908		233 11 5
		£1,615 9 9

We hereby certify that the above is a true extract from the Cash Book of the National Fruit and Cider Institute.

(Signed) CURTIS, JENKINS & CO.,
Chartered Accountants.

Bristol ; 8th May, 1909.

	£ s. d.	£ s. d.
By Balance due to Bankers		391 2 0
By SCIENTIFIC STAFF—		
Barker B. T. P., Salary	300 0 0	
Reynolds Professor, Soil investigations	25 0 0	
Sundry Expenses	10 0 3	
		335 0 3
By RENTS, RATES, etc.—		
Ashton Court Estate, Rent	80 0 0	
„ Interest on Loan	8 0 4	
„ One year's repayment	73 15 1	
Insurance, Rates, etc.	14 12 4	
		176 7 9
By Laboratory Fittings		4 8 9
By Machinery, Plant, etc. — Additions to Capital		93 5 10
By Buildings		51 6 9
By MANAGEMENT ACCOUNT—		
Auditors, Accountant and Correspondents	27 7 0	
Stationery and Printing	18 18 7	
Sundry Expenses	14 15 3	
		61 0 10
By ORCHARDS, PLANTATION & NURSERY ACCOUNT—		
Wages	199 1 4	
Trees and Manure	10 6 6	
Fruit Superintendent	47 0 8	
Sundry Bills and Expenses	67 7 10	
		323 16 4
By CIDER MAKING ACCOUNT—		
Wages	63 7 10	
Cider Fruit	34 1 5	
Carriage and Sundries	47 8 3	
		144 17 6
By MISCELLANEOUS—		
Show Expenses	18 11 3	
Sundries	15 12 6	
		34 3 9
		£1,615 9 9

Balance Sheet, 31st December, 1908.

Liabilities.	£	s.	d.	*Assets.*	£	s.	d.	£	s.	d.
LOAN ACCOUNT—				PROPERTY ACCOUNT—						
Balance due to Lady Smyth	155	6	11	Buildings, as 1907 Balance Sheet	295	15	5			
LLOYDS BANK—Overdraft	233	11	5	Additions, 1908	51	6	9			
					347	2	2			
				Less depreciation	69	8	5	277	13	9
				Laboratory fittings, as 1907	55	0	6			
				Additions, 1908	4	8	9			
					59	9	3			
				Less depreciation	11	17	10	47	11	5
				Machinery, Plant, etc., as 1907	184	2	8			
				Additions, 1908	93	5	10			
					277	8	6			
				Less depreciation	56	10	1	220	18	5
				STOCKS AS PER VALUATION—						
				Nursery	512	17	7			
				Cider	182	0	0	694	17	7
Balance	879	14	9	Sundry Debtors				27	11	11
	£1,268	13	1					£1,268	13	1

(Signed) C. W. RADCLIFFE COOKE,
A. E. BROOKE HUNT, } Governors.

Auditors' Report.—We report that we have audited the Books and Accounts of the Institute for the year ended 31st December, 1908, together with the Balance Sheet made up as on that day and above set forth. All the information and explanations required have been furnished to us. In our opinion the Balance Sheet above referred to is properly drawn up so as to exhibit a true and correct view of the state of the Institute's affairs according to the best of the information and explanations supplied to us, and as shown by the books of the Company.

(Signed) CURTIS, JENKINS & CO.,
Chartered Accountants.

APPENDIX.

REPORT BY B. T. P. BARKER, M.A., *Director*,

AND

J. ETTLE, F.R.H.S., *Superintendent of Fruit Department.*

THE EXPERIMENTAL CIDER WORK.

The sections of the present Report dealing with cider contain for the most part an account of the work carried on at the Institute during the cider-making season of 1907-1908. The apple crop for that season being very small, only a limited quantity of fruit was purchased for experimental purposes on a large scale; and since the total quantity of each variety obtained was also small, it was not possible to carry out any varied and extensive schemes of experiments on practical methods in the cider-house. A fair number of varieties were obtained for examination upon a small scale, while 205 samples were procured for analysis, this being the largest number thus far dealt with in a single season.

The vintage varieties examined included the following:—

Sharp Varieties.—Bloody Butcher, Bruford's No. 1, Dagg's Apple, Kingston Black, Lambrook Pippin, Langworthy, Neverblight, Porter's Perfection, Rouge de Treves, Slatter's No. I., Slatter's No. II., Yeovil Sour.

Sweet Varieties.—Bruford's No. II., Corton, Cremiere, Doux Amer, Ecarlatine, Guernsey, Hangdown, Harding's Apple, Hebditch's Sweet, Hebditch's Long Nose, Pommier Bedan, Pommier Binet Gris, Slack-ma-Girdle, Sweet Alford, Willis' Favourite, Woodbine.

Bitter-Sweet Varieties.—Ashton Bitter White, Ashton Early Red Jersey, Ashton White, Cardive Forestier, Glastonbury, Hebditch's Bittersweet, Horner, Italy, Lea's No. I., Medaille d'Or, Mons. Jacques, Prince Albert, Reine des Pommes, Taylor's Bitter, Tommy Rodford, Truckle, Wheeler's No. I.

The experimental work in the cider-house consisted mainly of the examination of these varieties from the vintage point of view, single-variety ciders being made from each kind, as in previous seasons. Details of the characters and qualities of the individual ciders will be found in another section of this Report.

Dealing with the general results obtained from this work, the most important new points brought to light, apart from those concerned with the qualities of the individual varieties as vintage sorts, are concerned with the management of the juice during fermentation, and with filtration. These are discussed below in a separate section. At the same time the features which have been noted in previous seasons during the course of the work on single-variety ciders, and which have already been dealt with in earlier Reports, have been again observed; and, by their general agreement with those of previous seasons, serve further to support the views which have been put forward as to the importance of the variety question in cider-making, and the respective values of the various characters of the fruit from a vintage point of view.

Probably the most noteworthy result which this work on single-variety ciders has established is that the quality of cider depends primarily upon the kinds of apples from which it is made, and that other factors, such as the kinds of ferments present, the methods of manufacture, and general management, although important and capable of exercising an appreciable influence upon the nature of the product, nevertheless take a secondary place, and cannot be compared with the fruit factor in their power of determining the quality of the beverage. It must not be understood from this statement that reference is made to irrational methods of dealing with the fruit, juice, or cider. It is obviously possible to ruin utterly the quality of a cider by mismanagement. The point it is desired to emphasize is that, provided the fruit and the juice obtained from it is treated in a reasonable manner, no matter what methods or system of manufacture are employed, the quality of the product will in the end depend mainly upon the kinds of apples used, and will only be modified to a comparatively slight extent by the system of manufacture adopted.

It follows, therefore, that the question as to which varieties of apples to select for propagation for vintage purposes becomes, perhaps, the most important of any for the cider industry. It has already been pointed out elsewhere that this selection should be determined largely by the vintage qualities of the varieties concerned, that representatives of each of the classes of sharp, sweet, and bitter-sweet apples should be grown, and, further, that these should be grown to a proportionate extent. In view of the very considerable difference between individual varieties as to vigour of growth, cropping qualities, and similar points, it is evident that other than purely vintage characters must be taken into consideration. Unfortunately for the cider-maker, many of the

varieties most desirable from a vintage point of view make comparatively poor trees, and yield badly in most situations. For instance, Kingston Black, probably the most widely grown variety, and one of the best as regards vintage characters, gives a weakly, slow growing, and comparatively poor-cropping, tree in most localities. On the other hand, varieties of the type of Morgan Sweet and Broad Leaf yield quick-growing, vigorous, and heavily cropping trees, but the fruit is of inferior vintage quality. It is, perhaps, premature at present to assert that the vintage quality of a variety varies inversely with its vigour of growth, but certainly the results thus far obtained during the course of the experimental work at the Institute appear to indicate that there may be a more or less direct connection between the nature of the growth of a tree and the type of cider produced from its fruit. It would be possible to instance many examples of varieties which normally make coarse, rapidly growing trees, which also yield a coarse, rapidly fermenting cider. In the same way it appears to be generally the case that the fruit of a delicate, weakly-growing variety produces a slowly fermenting cider of high quality. Bearing in mind the facts that a rapidly fermenting cider is comparatively rich, and a slowly fermenting cider poor, in assimilable nitrogenous substances, it appears probable rather than otherwise that there may be some connection between the vigour of growth of the tree and the rate of fermentation of the juice of its fruit, since it would be expected *a priori* that a vigorously growing tree would be more abundantly supplied with nitrogenous substances than a weakly growing specimen. The point is important, and opens up a new line of research ; but, until a considerable array of facts have been accumulated, it would be unwise to lay too much stress upon it. Its possibility, however, must not be overlooked, when considering the question of the selection of varieties for propagation, especially since the material facts already to hand appear to tend in that direction.

In any event, it seems likely that this question of selection will eventually resolve itself into a purely financial one. Viewed solely from the grower's point of view, preference would be given to the strong-growing and heavy-cropping varieties ; and from the maker's point of view, to the varieties of high vintage quality, regardless of characters of growth and cropping powers. It has just been shown that, in the case of certain varieties at any rate, these two positions are antagonistic. Since, however, in many instances the growers are also makers, the danger that too much stress may be placed upon habits of growth and cropping qualities, and too little upon

vintage characters, may easily be over-rated. There are at least two ways by which the difficulty may be more or less overcome. In the first place, buyers of cider fruit could fix its market price according to its vintage qualities. In that event, growers would be encouraged to propagate varieties of high vintage standard, since the higher price which the fruit would command would compensate for the possibly smaller crop. Such actually occurs already in the case of certain varieties of repute, such as Kingston Black and Foxwhelp; but it ought to be much more commonly practised, because in many cases high prices are given for fruit which yields cider of much lower value. Secondly, it is imperative that statistics should be collected showing the weights of the fruit crop of a number of trees of the same age of different varieties, and grown under similar conditions, and of the quantity and value of the cider produced from the fruit, when made under like conditions. Until such statistics are available, it is difficult to form any satisfactory estimate as to which is the more profitable course to adopt, to grow heavy cropping varieties which yield a large bulk of cider capable of commanding a moderate market price only, or less heavy cropping kinds which produce a smaller bulk of cider of higher market value. In due course such statistics will be available from the experimental orchards which have recently been planted; but, since this information cannot be obtained for some years ahead, it is hoped that any who may have similar information already available will bring it to the notice of the Institute. The work of selection would thereby be considerably facilitated.

Since the work on single-variety ciders began, a large number of the more widely grown sorts have been examined, and it is becoming possible to make some progress with regard to the selection of individual varieties as being worthy of extensive propagation. A considerable amount of information relating to the characters of these varieties has been obtained, and there should be little difficulty in selecting a preliminary list of sorts to be recommended for propagation. In view of the excellent results which have been achieved in France by the Association Française Pomologique in the direction of the improvement of the French vintage orchards by careful selection of varieties of high general character, it will, perhaps, be advisable to proceed upon similar lines in making a selection suited to the requirements of this country, adopting somewhat similar standards. In order to make the recommendations as authoritative as possible, it is proposed that a committee of recognised experts on vintage fruit should be formed, and that a list of recommended varieties should be published by that body

after examination of all available data. Such a course could hardly fail to be of the greatest possible benefit to the cider-making industry in future years, for undoubtedly the best prospects for the development of the industry lie in the direction of improving the general standard of fruit grown in the cider orchards.

The Characters of Single Variety Ciders Made in 1907-8.

The examination of the vintage qualities of selected varieties of apples and pears, which was started in 1904-5, and has been continued each season since that period, was advanced a further stage during the season 1907-8, the varieties being dealt with in the usual manner. It was noted during the course of the work in 1906-7 that in the case of certain sharp and bitter-sweet varieties of marked acidity and astringency respectively, the juices of which fermented at a comparatively slow rate, the quality of the cider, from the point of view of palatableness, was considerably improved by filtration at a comparatively early stage of fermentation, on account of the extra sweetness which it was possible to retain by this procedure making the excessive acidity or astringency. Since the vintage possibilities of the varieties seem to be better illustrated by such treatment, a similar course was adopted last season for all varieties which appeared likely to respond to it. In most cases the early filtration, followed by the early bottling required for sampling purposes, was responsible for so much after-fermentation in bottle, that disgorging was necessary by the following June. Consequently the later statistics of the fall in specific gravity of the respective samples in bottle were interfered with and, being therefore not strictly comparable, are only given as taken at the end of March in the following accounts of the individual ciders and perries. Those included below were made on a large scale in the cider-house.

Appendix A gives the results for the varieties tested on a small scale in the laboratory.

CIDERS.

Sharp Varieties—(including those containing normally at least .45 per cent. Malic Acid).

Kingston Black (Somerset).—Analysis of fresh juice, December 19th, 1907: specific gravity 1.056, malic acid .46 per cent., tannin .176 per cent. Average daily fall in specific gravity at 28° C., .0025. Filtered February 3rd, 1908: specific gravity 1.039. Specific gravity in bottle, March 23rd, 1908, 1.036. A rich sweet cider of medium briskness and good aroma; flavour pleasant and fruity. Excellent unblended.

Langworthy (Devon).—Analysis of fresh juice, November 29th, 1907: specific gravity 1.042, malic acid .30 per cent., tannin .116 per cent. Average daily fall in specific gravity at 28° C., .0035. Filtered December 23rd, 1907: specific gravity 1.027. Specific gravity in bottle, March 23rd, 1908: 1.023.

A light medium sweet cider of fair aroma ; flavour fair, but lacking in briskness, and not quite clean. The fruit was somewhat over-ripe and on the point of decay, when made up ; while the quality of the fresh juice in saccharine matter was poor. Fair alone or blended.

Porter's Perfection (Somerset).—Analysis of fresh juice, January 31st, 1908 : specific gravity 1.0475, malic acid .62 per cent. tannin .208 per cent. Average daily fall in specific gravity at 28° C., .002. Filtered February 24th, 1908 : specific gravity 1.039. Specific gravity in bottle, March 23rd, 1908 : 1.038. A full-bodied, sweet, fruity cider of very good quality ; flavour pleasantly brisk and very clean, aroma well marked and fruity. A very satisfactory cider alone or blended with a small quantity of a pure sweet cider. In general character it strongly resembles a Cap of Liberty cider, with the excessive acidity of the latter toned down, but it falls short of that variety in alcoholic strength owing to the lower content of sugar in the fresh juice.

Yeovil Sour (Somerset).—Analysis of fresh juice, December 10th, 1907 : specific gravity 1.050, malic acid .42 per cent., tannin .100 per cent. Average daily fall in specific gravity at 28° C., .0055. Filtered December 30th, 1907 : specific gravity 1.034. Specific gravity in bottle, March 23rd, 1908 : 1.023. A light, somewhat thin cider of fair quality ; flavour and aroma fair. Serviceable alone or blended, but lacking in fruity character owing to the rather high rate of fermentation.

SWEET VARIETIES—(including those containing normally less than .45 per cent. Malic Acid and .20 per cent. Tannin.

Corton (Somerset).—Analysis of fresh juice, November 29th, 1907 : specific gravity 1.046, malic acid .15 per cent., tannin .168 per cent. Average daily fall in specific gravity at 28° C., .0075. Filtered December 23rd, 1907 : specific gravity 1.031. Specific gravity in bottle, March 23rd, 1908, 1.023. A thin, somewhat coarse flavoured, medium sweet cider of moderate quality. Flavour and aroma moderate. Lacks character and body alone, and is better blended. Its high rate of fermentation renders it difficult to retain sweet.

Guernsey (Somerset).—Analysis of fresh juice, December 4th, 1907 : specific gravity 1.047, malic acid .17 per cent., tannin .162 per cent. Average daily fall in specific gravity at 28° C., .0045. Filtered January 6th, 1908 : specific gravity 1.033. Specific gravity in bottle, March 23rd, 1908 : 1.029. A fairly full bodied, sweet cider of medium richness ; aroma and flavour very fair. Useful alone, but preferable blended with a sharper cider.

Hangdown (Devon).—Analysis of fresh juice, November 21st, 1907 : specific gravity 1.042, malic acid .22 per cent., tannin .144 per cent. Average daily fall in specific gravity at 28° C., .008. Filtered December 10th, 1907 : specific gravity 1.035. Specific gravity in bottle, March 23rd, 1908 : 1.023. A thin, medium sweet cider of rather coarse flavour and moderate aroma. Lacking in body and quality, and better blended with a strong flavoured cider than unblended.

Hebditch's Sweet (Somerset).—Analysis of fresh juice, January 31st, 1907 : specific gravity 1.042, malic acid .23 per cent., tannin .156 per cent. Average daily fall in specific gravity at 28° C., .0035. Filtered February 17th, 1908 : specific gravity 1.033. Specific gravity in bottle, March 23rd, 1908 : 1.029. A sweet, fairly full bodied cider of good quality. Aroma and flavour clean and pleasant. Useful alone or blended. The fruit from which this cider was made was stored in an apple loft several weeks before being milled.

Hebditch's Sweet (Somerset).—Analysis of fresh juice, January 31st, 1907 : specific gravity 1.042, malic acid .21 per cent., tannin .160 per cent. Average daily fall in specific gravity at 28° C., .004. Filtered 17th February, 1908 : specific gravity 1.035. Specific gravity in bottle, March 23rd, 1908 : 1.031.

A cider of similar general character to the preceeding, but decidedly inferior in quality, and somewhat tainted in aroma and flavour. The fruit was taken from the same trees as the preceding, but was stored out of doors in a hurdle store, and at the time of making was not in such good condition as that stored under cover.

Slack-ma-Girdle (Devon).—Analysis of fresh juice, December 20th, 1907 : specific gravity 1.045, malic acid .12 per cent., tannin .132 per cent., Average daily fall in specific gravity at 28° C., .002. Filtered February 17th, 1908 : specific gravity, 1.037. Specific gravity in bottle, March 23rd, 1908 : 1.037. A very sweet, rich, full bodied cider ; flavour and aroma good. Pleasant alone, although somewhat too sweet ; better blended with a brisker cider.

Sweet Alford (Devon).—Analysis of fresh juice, December 10th, 1907 : specific gravity 1.053, malic acid .20 per cent., tannin .150 per cent. Average daily fall in specific gravity at 28° C., .0025. Filtered February 3rd, 1908 : specific gravity 1.033. Specific gravity in bottle, March 23rd, 1908 : 1.032. A full-bodied, sweet, rich cider of good flavour and aroma. Pleasant unblended, but less insipid blended with a sharper cider.

Willis' Favourite (Somerset).—Analysis of fresh juice, December 19th, 1907 : specific gravity 1.048, malic acid .16 per cent., tannin .196 per cent. Average daily fall in specific gravity at 28° C., .0040. Filtered January 18th, 1908 : specific gravity, 1.034. Specific gravity in bottle, March 23rd, 1908 : 1.031. A sweet, fairly full-bodied cider of good quality ; aroma and flavour very fair. Pleasant unblended, but lacking somewhat in character ; improved by blending with a brish cider.

Woodbine (Devon).—Analysis of fresh juice, December 20th, 1907 : specific gravity 1.051, malic acid .20 per cent., tannin .194 per cent. Average daily fall in specific gravity at 28° C., .004. Filtered February 5th, 1908 : specific gravity 1.035. Specific gravity in bottle March 23rd, 1908 : 1.032. A sweet, rich, full-bodied cider of good quality ; flavour and aroma pleasant and clean. Satisfactory for use alone, but improved by blending with a sharper cider.

BITTER-SWEET VARIETIES—(including those containing normally less than .45 per cent. Malic Acid, and more than .20 per cent. Tannin.

Hebditch's Red Bittersweet (Somerset).—Analysis of fresh juice, December 20th, 1907 : specific gravity 1.055, malic acid .20 per cent., tannin .380 per cent. Average daily fall in specific gravity at 28° C., .002. Filtered February 10th, 1908 : specific gravity 1.042. Specific gravity in bottle, March 23rd, 1908 : 1.040. An extremely sweet, rich, full-bodied cider ; flavour clean and somewhat bitter ; aroma pleasant and rather fruity. Not unpleasant alone, although the bitterness is slightly too pronounced, and extremely useful for blending.

Horner (Somerset).—Analysis of fresh juice, November 21st, 1907 : specific gravity 1.056, malic acid .18 per cent., tannin .226 per cent. Average daily fall in specific gravity at 28° C. .0025. Filtered January 3rd, 1908 : specific gravity 1.034. Specific gravity in bottle, March 23rd, 1908 : 1.034. A rich, sweet cider of good quality ; flavour clean and full, with a trace of bitterness ; aroma fruity and pleasant. A useful cider alone, and valuable for blending. Unfortunately this variety seems to be particularly liable to sickness.

Prince Albert (Gloucester).—Analysis of fresh juice, November 29th, 1907 : specific gravity 1.057, malic acid .19 per cent., tannin .300 per cent. Average daily fall in specific gravity at 28° C., .010. Filtered December 24th, 1907 : specific gravity 1.024. Specific gravity in bottle, March 23rd, 1908 : 1.013. A coarse, slightly sweet cider of strong, but unpleasant and bitter, flavour. Aroma moderate. Inferior alone, but can be utilised to give body and strength to insipid dry ciders.

Taylor's Bitter (Somerset).—Analysis of fresh juice, December 4th, 1907 : specific gravity 1.053, malic acid .18 per cent., tannin .208 per cent. Average daily fall in specific gravity at 28° C., .0025. Filtered January 20th, 1908 : specific gravity 1.034. Specific gravity in bottle, March 23rd, 1908 : 1.032. A full-flavoured, sweet cider of very fair quality : flavour pleasant, but without much character, and bitterness hardly perceptible. Useful alone or for blending.

Tommy Rodford (Somerset).—Analysis of fresh juice, January 31st, 1908 : specific gravity 1.043, malic acid .22 per cent., tannin .238 per cent. Average daily fall in specific gravity at 28° C., .005. Filtered February 24th, 1908 : specific gravity 1.031. Specific gravity in bottle, March 23rd, 1908 : 1.029. A sweet, fairly full-flavoured cider of pleasant taste ; aroma very fair. Useful alone, although slightly too bitter, and for blending.

Truckle (Somerset).—Analysis of fresh juice, November 29th, 1907 : specific gravity 1.051, malic acid .19 per cent., tannin .272 per cent. Average daily fall in specific gravity at 28° C., .0075. Filtered December 30th, 1907 : specific gravity 1.021. Specific gravity in bottle, March 23rd, 1908 : 1.006. A dry cider of coarse and rather bitter flavour ; aroma poor. Unsatisfactory alone, and inferior for blending.

PERRIES.

Blakeney Red (Gloucester).—Analysis of fresh juice, November 12th, 1907 : specific gravity 1.045, malic acid .51 per cent., tannin .046 per cent. Average daily fall in specific gravity at 28° C., .005. Filtered January 6th, 1908 : specific gravity 1.034. Specific gravity in bottle, March 23rd, 1908 : 1.029. A thin, brisk, medium sweet perry of fair aroma, but watery flavour. Tainted slightly with acetic fermentation, owing to the wet condition of the fruit previous to milling. Not rich enough for use alone, but serviceable for toning down perries of too heavy character.

Red (Worcester).—Analysis of fresh juice, November 12th, 1907 : specific gravity 1.044, malic acid .38 per cent., tannin .060 per cent. Average daily fall in specific gravity at 28° C., .005. Filtered December 10th, 1907 : specific gravity 1.033. Specific gravity in bottle March 23rd, 1908 : 1.020. A thin, medium sweet cider of little character, and inferior flavour and aroma. Tainted with acetic fermentation. This perry did not afford a fair test of the variety, since the condition of the fruit prior to making was bad.

Spice (Worcester).—Analysis of fresh juice, November 12th, 1907 : specific gravity 1.053, malic acid .63 per cent., tannin .080 per cent. Average daily fall in specific gravity at 28° C., .006. Filtered December 16th, 1907 : specific gravity 1.032. Specific gravity in bottle, March 23rd, 1908 : 1.022. A thin, brisk, medium sweet perry of inferior quality ; aroma and flavour somewhat tainted owing to acetic fermentation. In this case, also, the perry did not afford a fair test of the variety owing to the bad condition of the fruit.

The Influence of Various Conditions on the Quality of the Fruit.

Since it has been demonstrated that upon the nature and quality of the vintage fruit the quality of the cider is largely dependent, it has become of considerable importance that the various factors which govern the quality of the fruit should be examined in order to determine the means, if any, by which it may be improved. These factors may be grouped into two sections, those concerned with the nature of the tree itself, and those of a more external

character, which exert their influence by their effect on the development of the tree or of the fruit. In the former group may be included the nature of the root stock, and of the intermediate stock, if present, and the age of the tree ; while in the latter group fall the nature of the soil, general weather conditions, the growth of the trees in grassed orchards or in cultivated soil, the general situation of the tree, particularly with reference to its exposure to the sun, and the gathering and storage of the fruit prior to crushing.

The quality of the fruit from a vintage point of view depends mainly upon the chemical composition of the juice, using this expression in a broad sense. Any factors capable of influencing the percentage of sugar, malic acid, tannin, and other important constituents of the juice, are thus of importance, since the flavour or keeping quality of the cider is directly affected. Similarly any factors affecting the development of the aroma and flavour of the fruit—using the latter term in its restricted sense—must be considered to possess appreciable and material influence upon the product. Even more important are those factors which determine the amount of nitrogenous material in the juice, since the rate of fermentation is decided mainly by that detail.

The Influence of the Root Stock.—The influence of the nature of the root stock upon the quality of the fruit has thus far been little studied in its relation to vintage fruit. There is some evidence to show that market varieties of apples differ somewhat, when grown on the Paradise and crab stock respectively. If this is the case, one would expect to find that vintage fruits grown on crab or free stocks would also show some difference in character. Experiments are now in progress to endeavour to ascertain if this is so. The same variety of apple has been worked on a number of crab and free stocks. These trees will be grown under conditions as nearly equal in character as possible, so that the results of the examination of the fruit may be strictly comparable.

The Influence of the Intermediate Stock.—The nature of the intermediate stock, where such is used, is a possible source of influence upon the quality of the fruit. In many parts of the West of England it is customary to graft the vintage variety, which it is desired to grow, on the head of a well-grown standard tree of another variety. Thus the resultant tree is actually composed, or built up, of three distinct varieties, represented respectively by the root, stem, and branch systems. The root system represents the crab or free stock on which the tree itself is built up and worked in its nursery stage. The main stem, or,

as it is called, the intermediate stock, consists of the variety which is worked on the root-stock during the early stages of the tree in its nursery days; while the branch system, *i.e.*, the head of the tree, consists of the desired vintage variety, which is usually grafted or budded on the head of the intermediate stock after the tree is planted out in the orchard. The main reason for this procedure, instead of following the usual course of working the vintage variety on the original crab or free stock, is that many of the most valuable vintage varieties are comparatively slow and weak growers, and do not, therefore, produce good standard trees, if worked direct on the root-stock. Consequently a variety which is a strong and rapid grower, and makes a good standard, is selected as an intermediate stock. The possibility of the influence of the kind of intermediate stock upon the quality of the fruit produced by such composite trees has not hitherto been given much attention; but a special series of experiments on this point is now in progress at the Institute on a row of standard trees in the young orchard, and these are being supplemented by further experiments on the bush trees in the Paradise plantation of vintage varieties. The row of trees in the young orchard is made up of nineteen trees, planted in January, 1904, and head grafted in April, 1906, with the Dabinett variety, the intermediate stock in most cases being different. The following intermediate stocks have been used:—Morgan Sweet, Broad Leaf Jersey and Norman, King of the Pippins, Hardwick's, Warner's King (two trees), Bramley's Seedling (two trees), Ecklinville Pippin, Blenheim Orange (two trees), Annie Elizabeth, Newton Wonder, Peasgood's Nonsuch, Hollow Core, Sweet Alford, Broad Leaf, Court Royal, and Ecklinville Seedling. In the old orchard adjoining, a few young trees have also been planted, including the Annie Elizabeth, Morgan Sweet, and Newton Wonder varieties. On these also the Dabinett variety has been worked. A few of these trees fruited last season, and analyses were made of the respective juices, while this season most of the trees have produced sufficient fruit for analytical purposes. The following table shows the results obtained in the two seasons.

Before entering upon a discussion of the results given in the preceding table it should be fully understood that it would be unwise to attempt to base positive conclusions on the strength of them. So many factors are at work in determining composition of the juice that it can only be by comparing the results of a considerable number of seasons that the influence of the intermediate stock, if any, can be discerned, and the variation due to other factors eliminated. At the

Analyses of Dabinett Apples.

Variety of Intermediate Stock.	Composition of Juice.		
	Specific Gravity.	Malic Acid. per cent	Tannin. per cent.
Season 1907—			
Blenheim Orange ..	1.065	.24	.316
Broad Leaf Jersey ..	1.058	.20	.240
Ecklinville Seedling ..	1.055	.24	.310
King of the Pippins ..	1.060	.28	.276
Season 1908.			
Annie Elizabeth ..	1.0565	.20	.268
Blenheim Orange, Tree 1	1.057	.24	.374
Do. Tree 2	1.0625	.15	.364
Bramley's Seedling, Tree 1	1.0665	.17	.382
Do. Tree 2	1.062	.26	.324
Broad Leaf Jersey ..	1.075	.12	.308
Broad Leaf Norman ..	1.062	.24	.364
Court Royal	1.059	.18	.364
Ecklinville Pippin ..	1.0645	.19	.332
Ecklinville Seedling ..	1.065	.17	.282
Hardwicke	1.064	.24	.356
Hollow Core	1.064	.23	.304
King of the Pippins ..	1.064	.20	.290
Morgan Sweet, Tree 1 ..	1.064	.19	.414
Do. Tree 2 ..	1.0655	.18	.374
Do. Tree 3 ..	1.0625	.25	.348
Do. Tree 4 ..	1.063	.19	.420
Do. Tree 5 ..	1.060	.16	.334
Newton Wonder, Tree 1	1.073	.18	.384
Do. Tree 2	1.0535	.26	.274
Do. Tree 3	1.0665	.21	.344
Peasgood's Nonsuch ..	1.049	.21	.208
Sweet Alford	1.065	.30	.346
Warner's King, Tree 1	1.065	.18	.290
Do. Tree 2	1.0785	.22	.374
Mean Result for 1907 ..	1.0595	.24	.285
Mean Result for 1908 ..	1.0635	.20	.337
Mean Result for samples obtained from other sources in previous seasons ..	1.0535	.15	.263
Result for fruit grown at Woolston by Mr. C. Osborn in 1908	1.064	.17	.364
Result for fruit grown in the Nursery at the Institute on 4-year-old standard Dabinet trees in 1908	1.0565	.17	.248

same time the variations in the composition of the juice in certain instances are so wide that the subject is obviously one of considerable importance to the cider-maker, especially since the results have been obtained from trees growing side by side in the same orchard, and under almost identical conditions. The results for 1907 show a range in specific gravity from 1.065 to 1.055, in malic acid from .28 per cent. to .20 per cent., and in tannin from .316 per cent. to .240 per cent. For the season 1908, the specific gravity ranges from 1.0785 to 1.049, the malic acid percentage from .30 to .12, and the tannin percentage from .420 to .208. The main difference in 1907 was that of specific gravity, the variations in malic acid and tannin being comparatively small, and not sufficient to exercise any very material influence upon the flavour of the juice. In 1908, on the other hand, not only are the variations in specific gravity much more marked, but the difference in malic acid and tannin is so great in the extreme cases that the influence upon flavour is quite marked. Certain allowance must be made for the fact that the quantity of fruit dealt with in each case was small, and that, accordingly, the variation due to the difference in quality of individual specimens of fruit in each sample is much more pronounced than would be the case if the total bulk dealt with were larger. It is a well recognised fact that the composition of the juice of individual specimens of fruit grown upon the same tree varies to an appreciable extent in different instances, but even allowing for that, it is unlikely that the variation in the results under consideration can be attributed entirely to that factor, since the specimens taken for analysis were in each case of fairly regular size and, to all appearance, of approximately the same character as regards ripeness, colouration of the fruit, and similar features. It is interesting to observe that in no case are the proportions of malic acid and tannin in the juice affected to such an extent that the variety could be placed outside its recognised class of a medium bitter-sweet apple. That is to say, the Dabinett variety, which grown in the ordinary way belongs to the class of medium bitter-sweets, still retains the same general character of the class, even although in the extreme cases the limit of tannin is somewhat reduced below normal, and the acidity is rather higher than is usual. Such variations, however, are commonly found among fruit grown under normal conditions, and cannot, therefore, without further proof be considered as due to the intermediate stock. The case of the specific gravity is different. The average specific gravity for the variety, calculated from the analyses made of samples of fruit taken from different sources in previous seasons, is 1.0535,

while it stands at 1.064 for a sample grown this season by Messrs. Osborn at Woolston, and at 1.0565 for the sample grown this season on young standard Dabinett trees in the nursery at the Institute. The figures quoted in the foregoing table show that the specific gravity stands at a much higher point for certain of the trees, and is in the majority of cases well above the average for previous seasons. But, even though it be granted that in this particular season the general specific gravity of the variety tends to stand at a higher point than usual, and making allowance also for the fact that the specimens used for this series of analyses were carefully hand-picked and stored under advantageous conditions, the relatively high specific gravities in certain cases cannot probably be fully explained on those grounds, nor is any light thrown by them upon the cause of the wide variation in the results from the individual trees. The problem is complicated by the fact that, where there were two or more trees with intermediate stocks of the same variety, there appears to be no general agreement in the results as regards specific gravity, malic acid, and tannin, except in the case of the Morgan Sweet trees. For that variety the results may be held to show a remarkable agreement, having regard to the variation which exists in the other cases. It is clear, however, that even if it be admitted that the intermediate stock may exert some influence, there must be other factors of great importance at work to produce such varied results as were obtained, for example, in the case of the Newton Wonder variety. In this instance the difference in specific gravity between the two extreme examples was one of 20 points, which represents a difference of about 5 per cent. of sugar. When such differences can be obtained from trees growing under apparently almost identical conditions, it is obvious that there is a new and promising field of research in this direction, which might well result in the discovery of means by which the quality of cider fruit could be enormously improved.

The Influence of the Age of the Tree.—The possible influence of the age of the tree upon the quality of the fruit is one which merits attention, although this factor cannot in a sense be controlled by the grower. Little information has thus far been gathered upon this point, but a very striking case has come under notice during the past autumn in connection with three samples of Foxwhelp apples submitted for examination by Mr. C. W. Radcliffe Cooke. One sample of fruit was taken from a tree of this variety at least 60 or 70 years old, the other two samples from trees worked with the same variety after "rejuvenation." Rejuvenation consists in the grafting or budding of a variety three

times successively on young crab stocks, the idea being that a variety loses vigour after prolonged cultivation under ordinary conditions, and that its vitality may be renewed by repeated propagation on young vigorous crab stocks. Thus in this particular case the stock of the rejuvenated Foxwhelp was obtained by working a scion from an old Foxwhelp tree on a young crab stock, taking from it in turn another scion, when it had developed sufficiently, and working this again on the crab, this procedure being in due course repeated for a third time. The tree resulting from this final working was then allowed to develop, and now represents the variety in its "rejuvenated" state. Of the two rejuvenated samples of fruit examined, one was obtained from a 20-year-old tree, and the other from a young recently grafted stock. The following table gives the results of the analyses of the respective juices and particulars as to their rates of fermentation :—

Composition and Rate of Fermentation of Foxwhelp Juices.

Particulars of Sample.	Specific Gravity.	Malic Acid. per cent.	Tannin. per cent.
I. "Rejuvenated": fruit taken from a young recently-grafted Stock	1.059	1.06	.306
II. "Rejuvenated": fruit taken from a 20-year-old tree..	1.052	.59	.202
III. "Old" variety: from fruit taken from a tree at least 60 or 70 years old ..	1.089	1.40	.362

Specific gravities taken at intervals of 48 hrs.: juice kept at 28° C.

	Sample I.	Sample II.	Sample III.
Specific Gravity of freshly pressed juice	1.059	1.052	1.089
Ditto, after 48 hours at 28° C.	1.055	1.048	1.087
Ditto, „ 96 hours „ „	1.050	1.037	1.084
Ditto, „ 144 hours „ „	1.039	1.024	1.071
Ditto, „ 192 hours „ „	1.035	1.016	1.066
Ditto, „ 240 hours „ „	1.031	1.010	1.062
Mean fall in Specific Gravity during 48 hours	.0056	.0084	.0054

There is, therefore, a remarkable difference in the results obtained from the respective samples. The most striking is the extraordinary variation in specific gravity between the "rejuvenated" and "old" juices, the difference between that of Sample II. and Sample III. representing one of very nearly 10 per cent. of sugar. The same two samples are also distinguished by very marked differences in the percentages of malic acid and tannin, which are so great indeed that, if it were not for the facts that both samples are definitely asserted to belong to the same variety, and that the characters of the fruit, although displaying in certain respects decided differences, on the whole confirm this assertion, they would unquestionably have been regarded as belonging to two distinct varieties. As it is, the most probable explanation appears to be that the juice of the "rejuvenated" sample is much more watery than that of the "old" fruit, the percentages of sugar, malic acid and tannin being thereby largely reduced; or, stated in another form, the former juice is practically a much diluted form of the latter. The other "rejuvenated" sample, No. I., belongs more clearly to the same type of fruit as No. III., the percentages of malic acid and tannin in this case being comparatively slightly diminished, although here again there is a very large difference in specific gravity. A certain amount of dilution might once more be supposed, although less in this instance than in the preceding; but the difference in the results for Samples I. and II., as regards malic acid and tannin contents, still requires explanation, since the specific gravities in the two instances are sufficiently close to prevent these variations being accounted for simply by dilution. In physical characters these two samples clearly represented the same variety, the resemblances being much closer than with Sample III. The rates of fermentation in the respective instances are on the slow side as compared with the average juice, that of No. II. being decidedly the fastest, while the fermentation in Nos. I. and III. is slower, and progresses at practically the same rate in each case.

So far as these results go, therefore, it would appear as though the age of the tree might well prove to be a factor of considerable importance in determining the quality of the juice. While any conclusions based upon them alone would be worthless, they nevertheless suggest the idea that there may be some relation between the vigour of growth of the tree, as affected by its age, and the richness of the fruit. The tree in its youngest stages may produce fruit of fair quality as regards richness in saccharine material; but may tend, as it approaches its prime, to produce fruit of more watery character,—perhaps owing to the greater development and activity

of its root system, and therefore to its greater absorptive power,—and later, as the activities of its roots, and therefore the amount of water taken up, diminish, to yield again fruit of increasing degrees of richness. It must be left to future research to determine to what extent these surmises are confirmed by actual results.

Soil Influence.—It is generally believed that one of the most important factors which influences the quality of vintage fruit is that of the soil upon which the fruit is grown. The field of research in this direction is so wide, and the time demanded by the investigation so great, that it has not been found possible until recently to undertake any serious research on the subject. A short time ago, however, it became possible, by working in conjunction with the Department of Economic Biology of University College, Bristol, to make a start with such work, and it is now in progress. The present scope of the work includes an examination of the geological, physical, and chemical characters of the soils of cider orchards in which trees of the Kingston Black variety occur, and a comparison of the characters of the trees, fruit, and cider of this variety in the respective cases. The geological and physical examination of the soils has been undertaken by Professor S. H. Reynolds, M.A., and the chemical examination by Mr. C. J. Waterfall, F.I.C., F.C.S., while the work relating to the characters of the trees, fruit, and cider will be carried out by the Institute. The restriction of the work to orchards containing Kingston Black trees is introduced, so that it may be possible to obtain results from each class of soil, which, being gathered from the same variety, may be strictly comparable. The selection of Kingston Black as the test variety is due to the fact that it is practically the only one which is at all widely grown in all the cider-making districts in the West of England, while an added advantage is that it yields a good cider without blending. Samples of soil from a number of different orchards have already been taken and are at present undergoing examination, while, in addition to samples of fruit from these places, a number of others, making a total of 30 in all, have also been collected and examined from the point of view of vintage quality. The results thus far obtained show considerable differences in the specific gravities of the respective juices and some variation in the rate of fermentation, but the percentages of malic acid and tannin on the whole present but unimportant variations. Details of the analyses will be found in Appendix C.

The complete results of the season's work will be published in due course, but the amount of labour and time entailed in the

work is so great that only a comparatively small number of cases can be dealt with in a single season, and it is evident that, if the investigation is to be carried out thoroughly, it must extend over several seasons. It is hoped that all growers of Kingston Black apples, who are interested in this work, will send samples to the Institute for examination, when an endeavour will be made in each case to supplement this by visits to the orchards in which the fruit was grown, for the purposes of the soil examination.

The Relations Between the Quality of the Fruit and the Methods of Treatment of the Trees.

In last year's Report were included the results of the analyses of the fruit produced from individual trees grown in the young orchard at the Institute. It was then stated that so far as possible every season analyses of the produce of the individual trees would be made, in order that it might be ascertained how far the quality of the juice from individual trees of a given variety varies when the trees are grown in the same orchard and under very much the same general conditions. The trees of each variety have been treated in practically the same way since they were planted, with the exception that in certain instances grass has been allowed to grow to the base of the tree, while in other cases the turf has been removed around the base for a radius of 4ft. 6in. or 3ft. The results spread over a number of seasons should furnish some idea how far the individuality of a tree and the nature of the season can affect the quality of the fruit. The analytical results obtained from the 1908 crop are given in Appendix B. In certain instances it will be observed that the results differ considerably from those obtained the previous season, although it will obviously be impossible for any trustworthy conclusions to be drawn for some years to come.

The Variation in the Quality of the Juice during the Pressing of the Cheese.

There is considerable difference of opinion among cider-makers as to the variation in the quality of the juice, as it runs from the press, at different periods during the pressing. Many maintain that the juice which is expressed as soon as the pressure is brought to bear upon the cheese, *i.e.*, the first runnings, is richer in quality than any which flows later, when the pressure has been more prolonged and is greater. It is asserted by them that the last runnings are the poorest in quality, and that usually there is a gradual deterio-

ration in quality from the beginning to the end of the pressing; and they maintain, therefore, that if the juice which comes first from the press is kept separate from the subsequent runnings, the cider made from the former is of appreciably better quality than that obtained from the latter. They base their belief on the view that during the extraction of the juice the ripest cells of the fruit are the first to burst with their juice when pressure is applied, and that consequently the first runnings of the juice represent the product of the ripest and most mature portions of the fruit. Other makers, however, hold an entirely opposite view, declaring that it is the very clear juice which slowly flows from the cheese after pressure has been long applied, which produces the best cider. The point which they advance in explanation is that prolonged pressure is necessary to extract from the pomace the substances which are of most importance for giving bouquet and flavour to the cider, while the clearness of the juice of the later runnings and its comparative freedom from suspended particles of pomace and other solid matter favour the production of a better cider.

The subject has been studied from the point of view of the chemical composition of the juice by Truelle and Pic. Both of these authorities agree that there is an increased amount of mucilaginous and pectic matter in the juices of the later runnings, and that the amounts of tannin and malic acid vary irregularly in different instances at different periods of the pressing. They differ, however, with regard to the amounts of solid matter and of sugar in the juices of the different stages, the former finding that there is a gradual increase in the specific gravity of the juice, and a corresponding increase in the amounts of solid matter and sugar, as the duration of pressure lengthens, while the results of the latter showed that the specific gravity was highest for the first runnings, and gradually decreased in the later runnings.

Since the experimental work at the Institute was started, observations of the variations in the quality of the juice of different runnings from the same cheese have been regularly taken, and it has been found that, while variations in the specific gravity of the juice usually occur,—sometimes, although not usually, considerable in amount,—there appears to be no constant relation between the nature of such variations and the period of duration of the pressure. The following table gives illustrations of the various types of variations which have been observed, the records having been taken respectively from the first runnings from the cheese as soon as pressure was applied, the "middle" runnings, *i.e.*, when the flow of juice was at its height, and the runnings from the cheese, after it

had been once pressed and broken up, as it was being pressed a second time.

Name of Variety.	First Pressing.		Second Pressing.
	Specific Gravity of Juice from 1st Runnings.	Specific Gravity of Juice from Middle Runnings.	Specific Gravity of Juice.
Cherry Norman	1.057	1.0555	1.054
Lambrook Pippin ..	1.0515	1.0535	1.0545
Prince of Wales' Crab ..	1.0465	1.050	1.0505
Kingston Black	1.052	1.054	1.053
Woodbine	1.055	1.052	1.053
Truckle	1.049	1.049	1.049
Ansell	1.062	1.0645	1.0645
Sweet Alford	1.053	1.053	1.052

With regard to the variations in the chemical composition of the juice, it has been found that as a rule the percentages of total solid matter and sugar vary in the same direction as the specific gravity, that the percentage of malic acid varies irregularly and apparently bears no relation to the period of pressing at which the sample was taken or to the variations in specific gravity, and that the percentage of oxidisable tannin almost invariably decreases as the period of pressing extends. With regard to the latter result, it should be stated that the method of estimation of tannin used is that referred to in the Report for 1906, and that the figures express the relative reducing powers of the respective samples, calculated as tannin, on standard potassium permanganate solution, as limited by the presence of indigo carmine as an indicator, rather than the actual amounts of tannin present. The analyses given in the following table are typical of the results obtained.

Name of Variety.	Specific Gravity.	Percentage Composition of Juice.			
		Total Solids.	Total Sugar.	Malic Acid.	Tannin.
PRINCE OF WALES' CRAB.					
1st pressing { 1st runnings ..	1.046	10.90	9.62	.87	.206
1st pressing { Middle runnings..	1.050	11.34	9.92	.89	.178
2nd pressing	1.0505	11.34	9.72	.88	.082
STRAWBERRY NORMAN.					
1st pressing { 1st runnings ..	1.0565	13.40	11.71	.27	.254
1st pressing { Middle runnings..	1.055	13.28	11.57	.21	.198
2nd pressing	1.055	13.26	11.57	.21	.146
CHERRY NORMAN.					
1st pressing { 1st runnings ..	1.057	13.72	11.84	.24	.318
1st pressing { Middle runnings..	1.0555	13.50	11.71	.22	.288
2nd pressing	1.054	13.14	11.57	.20	.128

The foregoing results appear then to disprove the idea that there is any constant relation between the quality of the juice and the length of time which the cheese has been under pressure. Since, however, it has been found by previous experience at the Institute that the quality of the cider produced from a given juice is by no means indicated by the quality of that juice as expressed by its chemical composition on the lines given in the preceding table, and that the rate of fermentation of the juice is one of the most, if not the most, important factor in determining the quality of the cider, a number of tests have been made to ascertain if there is any variation in the rate of fermentation of the juice taken at different periods of the pressing. The results show that there is some variation, the extent of which as a rule is not considerable, but is, nevertheless in some cases sufficient to affect appreciably the quality of the cider. As with the chemical composition of the juice, however, there is apparently no definite relation between the variations in the rate of fermentation and the period of pressing at which the samples are taken, as is shown by the following table :—

Name of Variety.	Specific Gravity of Juice direct from the Press.	Specific Gravity of Juice kept at 28 deg. C.			
		after 24 hours.	after 48 hours.	after 96 hours.	after 148 hours.
YARLINGTON MILL.					
1st pressing 1st runnings ..	1.051	1.049	1.045	1.032	1.025
1st pressing Middle runnings	1.050	1.049	1.045	1.035	1.030
2nd pressing	1.050	1.048	1.043	1.035	1.030
GUERNSEY.					
1st pressing 1st runnings ..	1.048	1.046	1.040	1.029	1.0195
1st pressing Middle runnings	1.047	1.0455	1.041	1.033	1.0265
2nd pressing	1.048	1.0455	1.0435	1.038	1.0305
CORTON.					
1st pressing 1st runnings ..	1.047	1.044	1.040	1.0305	1.024
1st pressing Middle runnings	1.046	1.043	1.037	1.0255	1.0175
2nd pressing	1.047	1.042	1.037	1.026	1.014

It will be noticed from the examples given in this table that although sometimes the rate of fermentation is more rapid in the case of the earlier runnings from the press, and at others slower, the juice taken from the middle runnings possesses a rate of fermentation more or less intermediate between that of the two extreme runnings ; and this tendency is on the whole shown for most of the other cases examined. In several instances it has been found that

there is practically no variation in the rate of fermentation of the different runnings.

The varying results with regard to the rate of fermentation perhaps serve to explain the different experiences and views of practical makers with regard to the quality of the juice yielded at the various periods of pressing. In those instances where the rate of fermentation of the first runnings was lower than that of the later runnings the tendency would be for the former to produce cider of better quality, and *vice versa.*

There appears to be no decisive evidence to be gained from the results to account for their varying nature; but, seeing that in dealing with ciders made from the same variety of apple the rate of fermentation is largely decided by the condition of ripeness of the fruit at the time of grinding, there is some ground for suggesting that the condition of the fruit may be the deciding factor in this case. If it be the case that the riper the cells of the fruit are the more easily the juice is expressed, then, supposing the fruit at the time of grinding to be in a condition of perfect ripeness, the juice of the first runnings, coming from the most mature cells, would be of the best quality, and would ferment at a slower rate than that of the subsequent runnings, since the latter would be derived from cells of a somewhat less perfect state of ripeness. Consequently, the cider from the former would be superior to that from the latter. If, however, the sample of fruit be over-ripe, when milled, the juice first expressed would possess a more rapid rate of fermentation than that expressed later, since the latter would be derived from the cells most nearly approaching a perfect state of ripeness. In this instance the cider made from the later runnings would be of better quality. If the fruit be under-ripe, when milled, the rate of fermentation of the first runnings would be the slower, since that juice would most nearly represent the thoroughly ripe condition. Here, again, the best cider would be expected from the first runnings.

In considering this question the possibility of the type of mill used for grinding the fruit affecting the result ought not to be overlooked. The above results were obtained from the very finely ground pomace, produced by a " grater " mill. It is to be expected that the juice expressed from fruit reduced to so fine a state of division would be more even in quality during the different periods of pressing than that obtained from the more coarsely pulped pomace produced by a " crusher " mill. It may very well be found that much more strongly defined variations in quality occur when the latter type of mill is used.

The Chemical Composition of Ciders.

In view of recent discussions with regard to the alleged prevalence of adulteration of cider and the means by which such practices could be checked, it has been considered desirable to obtain certain data relating to the chemical composition of pure ciders, the history of which is fully known, in order that the variations in composition of ciders of different type may be compared and the nature and extent of adulteration capable of detection thereby demonstrated. This subject has already occupied considerable attention in other countries, and in certain instances a standard of chemical composition has been formulated. If the article falls below this, it is considered as not being entitled to be described as cider. Such a standard is necessarily very low on account of extreme differences in composition which occur in genuine ciders of different types, and there is thus a certain amount of sophistication possible within the limits of the law. Its existence, however, does undeniably tend to place a check upon excessive adulteration. Several standards have been proposed by different authorities, and these have been based upon the analytical results furnished by the examination of large numbers of different types of cider. The composition of cider is, however, so variable in different districts, that it is not safe to conclude without evidence that a standard which has been adopted as satisfactory in another country will prove a suitable one here. At the present time the number of complete analyses of English-made ciders available for comparison, which could be relied upon as genuine, is so limited, that it would be premature to attempt to base a standard upon them, or to draw conclusions as to the value of any such standard in checking undesirable practices. Dr. Durham, who has devoted considerable attention to the subject, in a paper read before the Society of Public Health last year, has called attention to the desirability of defining cider and perry by means of some standard of chemical composition, and has shown the necessity of the accumulation of further data as to the composition of English ciders before the matter can be pressed further. Prior to the organisation of the deputation to the President of the Board of Agriculture in 1907, a certain amount of research upon this subject had been carried on at the Institute, which resulted in the discovery of a test by which it is possible to distinguish between ciders made from apple juice and the spurious so-called "ciders," which are artificial preparations and contain no apple juice. Owing to the action of the Board the appellation of the latter as "cider" has now been declared to be fraudulent.

Further work has more recently been undertaken in conjunction with Mr. Edward Russell, B.Sc., F.I.C., Public Analyst and Bacteriologist to the City of Bristol, as to the variations in composition of cider, which it is hoped to continue until sufficient data have been collected to furnish a satisfactory knowledge of the limits of chemical composition of genuine ciders produced in this country. A preliminary paper, summarising previous work on the subject and dealing with the results already obtained, was recently read before the Society of Public Analysts, and has been published in the "Analyst," April, 1909. Since the details of the subject are necessarily exclusively chemical and of a nature to appeal to the chemist rather than the practical cider-maker, it is not proposed to consider them further here; but those specially interested in the subject can obtain full particulars by reference to the above-mentioned journal or by application to the Institute. Any developments or conclusions of general interest will be dealt with in subsequent reports.

Investigations on Cider Yeasts.

Since the beginning of the experimental work at the Institute, investigations have been in progress in connection with the ferments of cider and the parts played by the different varieties of yeasts in relation to the progress of fermentation of cider and the effect upon flavour. During the course of these studies a very large number of these organisms have been isolated, and it is estimated that at least 200 different varieties have been examined, while in very many instances the same kinds have been repeatedly found. A knowledge has thus been gained of the general characters of cider ferments of common occurrence, and the studies are now being extended in various directions to gain some information as to their distribution and significance.

During the past season special attention has been paid to the yeasts occurring in bottled ciders, since it is probably to these organisms that the changes of flavour brought about during the period of maturing are largely due. The work has been carried out in collaboration with Miss E. B. Pearce, B.Sc., Assistant Lecturer in Botany at University College, Bristol. Five samples of bottled cider, made at the Institute during the seasons 1904, 1905, and 1906, were selected for investigation, the respective ciders being Sweet Alford (season 1904), Kingston Black (season 1904), Sweet Alford (season 1905), Sweet Alford (season 1906), and Kingston Black (season 1906). From these ciders fifteen yeasts in all were isolated, the largest number in any one instance being four, the

cider in this case being Sweet Alford (season 1906). It was expected that the examination of these yeasts might possibly throw some light upon the question as to the association of special kinds of yeasts with certain varieties of apples. After a study of the characters of each kind isolated, it was found that they included thirteen distinct kinds, there being thus only in two cases similar sorts isolated. It is evident, therefore, that the investigation lends no support to the idea that particular yeasts are to be found associated with a given variety of apple, since if this were so, it would be expected that at least one yeast would be found common to the three different samples of Sweet Alford cider, or to the two samples of Kingston Black cider. The lack of varieties common to the ciders of the same season's make, *i.e.*, to Sweet Alford (season 1904) and Kingston Black (season 1904), or to Sweet Alford (season 1906) and Kingston Black (season 1906) appears at first sight to disprove the idea that there may each season be a group of yeasts associated with the cider factory, which find their way into the various juices from the appliances used in the course of cider-making, and dominate the fermentations of these ciders. It appears, indeed, from the results that the yeast floras of mature ciders are very varied in character and that no two lots of cider, even when made in the same season and in the same cider house, are likely to possess yeast floras of entirely similar character. The nature of the flora of any particular cider is thus, as far as can be seen at present, subject to no definite rule ; and it cannot be wondered that, under such circumstances, so great variations in quality are found among ciders of the same make and from the same kinds of apple. The need for the use of selected yeasts to dominate the fermentation, in order to produce more uniformity in the results, is thus strikingly demonstrated.

The Filtration of Cider.

In last season's Report reference was made to the question of cider filtration, and the manner in which it could be utilised for the purpose of checking the fermentation, and thus of retaining some sweetness in the product. It was then stated that certain types of cider, viz., the rapidly fermenting juices, could not be so successfully dealt with as others which fermented more slowly, and that satisfactory results could not therefore be expected from the treatment unless the rate of fermentation were taken into consideration. Further experiments have since been conducted on this point, and the following summary of the results may prove of value to makers who use a filter, by tending to indicate how filtering may be carried out to best advantage.

The three factors which appear to be of primary importance are the composition of the juice, its rate of fermentation, and the time of year at which the operation is performed.

The composition of the juice undoubtedly has much to do with the success or failure of filtration. Almost invariably it has been found that ciders containing more than ·4 per cent. of malic acid filter more easily and more brightly than those containing a lower percentage of malic acid. Thus ciders made from sharp fruit only, or from blends containing a large proportion of sharp fruit, are more easily and more quickly obtained in a perfectly bright condition than those made from sweet or bitter-sweet apples, or from blends in which these sorts predominate. There does not appear to be much difference as a rule between the two latter types in this respect, in spite of the commonly accepted opinion that tannin aids the clearing of the juice. Presumably the percentage of tannin required to accomplish this effectively is much larger than is usually found, or the presence of a moderate quantity of acid may be required to aid its action.

Corresponding differences between sharp, sweet, and bitter-sweet ciders have also been noticed in connection with bottled samples. Although ciders of these types may be bottled in equally clear condition, after standing in bottle for some time there is a decided difference in their character. The deposit which is thrown down in the case of a sharp cider is as a rule firm and not easily disturbed, while in the case of the other two types it tends to be generally flocculent and liable to disturbance on the least movement of the bottle.

The rate of fermentation, as pointed out on previous occasions, exercises a great influence on the effectiveness of filtration, it being in many instances practically impossible, even after repeated filtrations, to obtain rapidly fermenting ciders in a brilliant condition until nearly the whole of the sweetness has been lost; while slowly fermenting ciders present comparatively little difficulty, even when filtered at a high specific gravity. Ciders fermenting at a moderate rate can usually be dealt with satisfactorily at a fairly high specific gravity, although a second filtration is frequently necessary.

The time of year at which filtration is carried out affects the operation to a marked extent. In general, ciders of the current season's make filtered before the end of November give unsatisfactory results, it being found difficult to get rid of a certain hazy appearance, although the filtration may be repeated two or three times. During December the results are more satisfactory, but

much depends upon the nature of the cider and the temperature. A low temperature favours filtration, while a high temperature generally renders filtration more difficult. After December filtration becomes easier, and satisfactory results may in most instances be obtained after one operation or, in difficult cases, two operations.

The age of the cider is also a factor of some importance, the rule being that the older a cider is the better it will pass through the filter; but, since the rate of fermentation is generally the determining factor as to the time at which it is desired to filter, the matter of age is rarely allowed to have much influence.

It has been noticed during the course of the work that unfiltered cider keeps better in cask, and is less affected by acetic fermentation, than the filtered article; and it has also been observed that filtration tends to weaken the flavour and deprive it of some of its body. This effect is especially noticeable when filtration has had to be repeated, and there is certainly some force in the arguments of those who dislike the practice on those grounds. At the same time its advantages from a commercial point of view appear to counterbalance fully this drawback.

Applying the knowledge which has been gained to the treatment of the various types of cider the following conclusions seem justified:—

Of the ciders made during the first half of the season it is only those which ferment slowly or at an extremely moderate rate which offer much prospect of being dealt with to financial advantage by filtration. Those possessed of a fair amount of acidity may sometimes be filtered with advantage, where ciders of similar class, but with less acidity, prove unsatisfactory. The most satisfactory specific gravity at which filtration should be first attempted ranges probably about 1.035, except for ciders which ferment extremely slowly. These may be dealt with at a lower point, if desired.

The ciders made later in the season offer more scope for variation in treatment, and as a rule give much better results. Occasionally a rapidly fermenting cider, particularly if its content of acidity is rather high, may be made to retain a moderate degree of sweetness by filtering twice in quick succession, and later again if renewed cloudiness occurs. Unless, however, it is a strong flavoured juice, it is doubtful if the result will justify the attempt to retain sweetness, since its flavour will almost certainly be considerably dimished by the repeated filtration. Moderately fermenting and slowly fermenting juices of fair or high acidity can generally be rendered perfectly bright by a single filtration, even at a very high specific gravity. Kingston Black ciders afford very good examples of this type. With such ciders, even if the first filtration does not

yield satisfactory results, passing through the filter a second time will almost certainly give the desired result. Sweet and bittersweet ciders fermenting at a moderate rate frequently require at least two filtrations, unless made very late in the season, while occasionally slowly fermenting ciders of this type may also require to be filtered twice. It is difficult in any case to obtain them of the same degree of brilliancy as more acid ciders.

It will be seen, therefore, that the operation of filtration is one attended with a great deal of uncertainty in its results and, if performed without due regard to the character of the cider dealt with, may easily do more harm than good. In general, the advice may be given to utilise the filter no more than is absolutely necessary, to delay its use until the latest possible moment required to produce the desired result, and, in the case of dry ciders, to avoid filtration unless it is necessary to clear them, in such cases not filtering until the cider is about to be placed upon the market.

New Experimental Orchards in Various Counties.

The Board of Agriculture, the Bath and West Society, and the County Councils of Devon, Somerset, Gloucester, Hereford, Worcester and Monmouth, have each received grants of 300 vintage trees to form experimental orchards in connection with the Institute. In each county the orchards are to be under the supervision of the County Instructor, who will utilise them for demonstrations of pruning, spraying, etc. When the trees come into bearing, the fruit, or as much of it as is desired, will be purchased by the Institute Committee for analytical and other purposes.

The selection of the varieties rested ultimately with the bodies to whom the trees were presented, and in certain instances the decision was guided by special local conditions. In the majority of cases, however, the Institute was asked to recommend selections. In such instances, in making the choices, two ends were kept in view, viz., to utilise each orchard as far as possible for a trial of standard vintage varieties new to the particular district, and to balance the proportions of sharp, sweet and bittersweet varieties planted at each station, so as to make each orchard self-contained for vintage purposes. It is hoped, therefore, that in course of time these orchards will not only serve to make more generally known the varieties of best vintage quality, but also to furnish particulars as to the kinds which succeed best for the various localities, and the most satisfactory methods of grouping and proportioning the different types. The details of the selections for the various centres are to be found in Appendix F, the numbers given in brackets after the name of the variety indicating the number of trees of that variety.

The Influence of Grass upon the Growth of Orchard Trees.

It has been clearly demonstrated by the experiments at Woburn and elsewhere that if fruit trees are planted in grass land, and the grass allowed to grow immediately around the base of the trees, their growth is prejudicially affected and more or less severely checked, while the characters of the fruit are also materially influenced. In the young orchard at the Institute, which was planted in the early spring of 1904 with vintage varieties of apples and pears, these experiments have been repeated with certain modifications and have also been somewhat extended.

At the time of planting, circular holes 6ft. in diameter were dug, the trees being planted exactly in the centre of these. Instead of allowing the grass to grow again immediately up to the base of the tree, according to the old and still common practice, it was decided in view of the Woburn results to keep the soil cultivated around the trees to an extent corresponding with the limits of the original holes for the space of one year, in order to allow the tree to establish itself under the most favourable circumstances. At the expiration of the first year after planting, *i.e.*, in the spring of 1905, the scheme of experiments referred to came into force. Throughout the orchard there are five or ten trees of certain varieties planted, and it was arranged that for at least one tree of each variety (*a*) the area of cultivated soil around the tree should be extended to a circle 9ft. in diameter ; (*b*) the cultivated area should be allowed to grass over ; (*c*) the cultivated area should remain at the original dimensions, viz., a circle of 6ft. diameter. Duplicates of each of these systems were arranged, as far as the numbers of the trees of any one variety permitted. The effect of the various methods of treatment on the growth of the trees was estimated by taking annual measurements of the girths of the individual trees at a height of 5ft. 6in. above the soil level, these being taken each year about the middle of March. Although the increase in girth of a tree is admittedly not the most satisfactory mode of measurement to use for the estimation of the rate of growth, this factor was adopted on this occasion on account of the rapidity with which the measurements can be taken, pressure of work in other directions making it impossible for the time necessary for more elaborate measurements to be spared ; while in addition, when the scheme was started, it was more with the idea of providing a demonstration of the injurious effect of grass than of supplying a series of exact statistics to supplement those already recorded at other stations. However, the results have proved on the whole to be of so definite a

character that a summarised statement of them may prove to be not only of general, but also of scientific interest.

In the following summary account is only taken of trees which have not been head-grafted since planted. Throughout the orchard the trees in alternate rows have been head-worked and, although the same arrangements as to grassing, etc., hold good, the introduction of the additional factors of grafting, and of the variation in the varieties worked, complicates the interpretation of the results, which must, therefore, be considered separately on a later occasion.

Taking the girth of each tree, as shown by the measurements of 1906—this being the first year of taking the records,—which thus represent the results after the scheme had been in operation one year, as 100, and calculating the subsequent girths relative to this figure in order that the results for each tree may be easily compared, it was found that the average measurements when last taken (March, 1909), were as follows :—

Treatment of Tree.	Number of Trees.	Girth in March, 1906.	Average Girth, March, 1909.
Trees in cultivated area, 9ft. in diameter ..	38	100	195
Ditto. 6ft. ditto ..	34	100	183
Trees in grass	19	100	172

While that table shows very clearly the beneficial effects of cultivation and, in particular, the extension of the cultivated area, the results are still more marked, if allowance is made for certain irregularities in the conditions in different sections of the orchard. There are trees of twelve varieties included in the above results, but four of these varieties have undoubtedly been irregularly affected owing to their situation by the overflow from a manure water tank, and the immediate proximity of fully grown walnut trees. Omitting these varieties, and including only the eight kinds in which the conditions for the individual trees may be said to be approximately equal, the results are modified as follows :—

Treatment of Tree.	Number of Trees.	Girth, March, 1906.	Average Girth, March, 1909
Trees in cultivated area, 9ft. in diameter ..	30	100	194
Ditto. 6ft. Ditto. ..	24	100	177
Trees in grass	15	100	165

The statistics for the individual varieties from which the preceding table is calculated are as under :—

Name of Variety.		Number of Trees.	Girth, March, 1906.	Average Girth, March, 1909.
Broadleaf Norman,	Cultivated area 9ft. ..	4	100	173.25
Do.	Do. 6ft. ..	3	100	154
Do.	Grass	2	100	168.5
Cherry Norman.	Cultivated area 9ft. ..	4	100	190
Do.	Do. 6ft. ..	3	100	177
Do.	Grass	2	100	165.5
Cowarne Red.	Cultivated area 9ft. ..	4	100	183.5
Do.	Do. 6ft. ..	2	100	177
Do.	Grass	2	100	159.5
Foxwhelp	Cultivated area 9ft. ..	2	100	195.5
Do.	Do. 6ft. ..	2	100	160
Do.	Grass	1	100	144
Knotted Kernel.	Cultivated area 9ft. ..	4	100	221.75
Do.	Do. 6ft. ..	4	100	204.25
Do.	Grass	2	100	187.5
Medaille d'Or.	Cultivated area 9ft. ..	4	100	190.25
Do.	Do. 6ft. ..	4	100	184.75
Do.	Grass	2	100	159.5
Skryme's Kernel.	Cultivated area 9ft. ..	4	100	184
Do.	Do. 6ft. ..	4	100	174.25
Do.	Grass	2	100	164
Strawberry Norman.	Cultivated area 9ft. ..	4	100	210.75
Do.	Do. 6ft. ..	2	100	186.5
Do.	Grass	2	100	169.5

There is a remarkable unanimity in the results for each variety as regards the influence of grassing. In every instance, except Broad Leaf Norman, the trees which have made the greatest percentage increase in growth are those around which a circular area of 9ft. diameter is kept free from grass, and those which have made the poorest growth are those in grass, the intermediate position being occupied by those in the circular area of 6ft. diameter kept free from grass. The exceptional position of Broad Leaf Norman is very possibly accounted for by the fact that this variety has proved extremely susceptible to canker, the influence of which on the development of the individual trees has been variable.

There can be no doubt from these figures that the grassing over of the original cultivated area of 6 ft. diameter has resulted in an appreciable check to their rate of growth, while the extension of the cultivated area to 9 ft. diameter has been beneficial. This seems to show that it is the fine rootlets actively engaged in the absorption of food substances which are most affected by the presence of grass, their extension beyond the limits of the original

cultivated area of 6 feet diameter having occurred in most cases at the outset of the experiment, placing them, therefore, in a position to gain special advantage from the extension of the area to 9 feet.

It has been shown during the course of the experiments at other centres that the quality of the fruit has been affected by the presence of grass. Since all the varieties in the present experiment are vintage fruits, it will be extremely interesting to cider-makers to see how far the quality of the cider is influenced. The trees have not yet produced much fruit, but in a few instances sufficient for analysis has been obtained.

The results will be found in Appendix B. The data available up to the present time are, however, not sufficient to allow of any conclusions being formed.

The Comparative Merits of the "Hereford" and "Somerset" Systems for the Culture of Vintage Fruit.

In earlier reports reference has been made to the trials which are in progress in the Young Orchard at the Institute as to the relative merits of the so-called "Hereford" and "Somerset" systems of growing cider standard trees. The distinctive names of the two systems have no special significance, since the former is commonly practised in all the cider-growing centres, although, perhaps, the latter, as a general practice, is mainly confined to certain districts of Somerset. According to the "Hereford" system the tree is worked in the usual way at the base of the parent stock in the nursery, with the variety intended to be grown permanently, while in the "Somerset" system a well-grown tree of a strongly growing variety is planted in its permanent position in the orchard, and allowed to produce a good well-balanced head, which afterwards is cut back and worked on each main branch with the selected vintage variety.

The former system has the advantage of simplicity, and involves no trouble for re-grafting, while it is urged in favour of the other that a better tree generally results, since a good foundation is obtained at the start by using the strongly-growing variety, whereas many of the most valuable vintage varieties are weak growers and make poor standard trees if worked in the ordinary way. Whether or not the latter method results in a serious loss of time as far as the development of the tree is concerned is a disputed point, and it also remains to be proved which method is best adapted in the long run for vintage purposes.

Trials of the two systems in alternating rows are being carried on in the Young Orchard, the experiments on the grassing of young trees referred to in the preceding section of this Report being

conducted at the same time. Annual measurements of every tree have been made as there described, with the result that it is clearly shown that the "Somerset" method of treatment causes a decided check in development, temporarily at any rate. Taking by far the most favourable case for the latter system, that of six Morgan Sweet trees headworked with Reinette Obry, Cremiere, and M. Jacques, in April, 1905, this being one year after planting, and expressing the growth in the same terms as in the previous section, the average comparative size for the six trees in March, 1909, was 173, as against 100 in March, 1906, whereas the average for all trees under the "Hereford" system was 186 in March, 1909, as against 100 in March, 1906; while the average for all trees, 70 in number, under the "Somerset" system was only 134 in March, 1909.

It should be stated that the time of re-grafting the "Somerset" trees appears to make a considerable difference to the extent of the check sustained by the tree. Almost invariably the trees grafted in 1905, *i.e.*, one year after planting, have suffered decidedly less check than those not worked until 1906. Thus, considering the case of three Warner's King trees, grafted with Ecarlatine, one tree in 1905, and the other two in 1906, the girth of the former in March, 1909, was represented by 166, while that of the two latter only reached 116 and 119 in the respective instances. Corresponding results are given by other varieties. It is intended to test this result by further experiments, since, although the figures in each instance tend in the same direction, the actual number of trees undergoing exactly the same form of treatment is small.

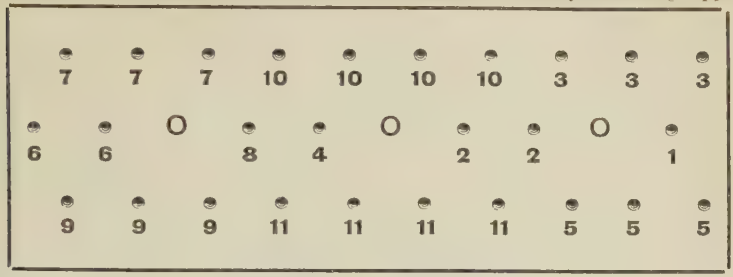
Experiments on the Pruning of Apple and Pear Bushes.

The scheme of pruning experiments arranged to be carried out on the apple and pear bush trees in Plantation No. I. is now in operation, and, although it has only been in progress a short time, and the trees are still quite young, the yields of fruit produced last season by the bushes under the different methods of treatment furnished some interesting results.

There are twelve varieties of apples and four varieties of pears included in the plantation, there being 27 bushes—worked on the Paradise stock for apples, and on the quince stock for pears—and 3 standards of each variety. The trees of each variety are grown in three consecutive rows, arranged as shown in the accompanying diagram, so that the plantation is practically composed of sixteen separate plots, each consisting of one variety. The system of pruning for each bush in the Bramley's Seedling plot is shown in the accompanying diagram, the corresponding trees in the other plots being treated similarly.

PLAN OF PRUNING EXPERIMENT SCHEME

showing the arrangement of the individual bushes of Bramley's Seedling Apple.



EXPLANATION OF DIAGRAM.

● Bush trees. O Standards.

1	Not shortened, but thinned only.		6	Severely shortened.	
2	Slightly shortened.		7	Do.	Summer pruned.
3	Do.	Summer pruned.	8	Do.	Root pruned.
4	Do.	Root pruned.	9	Do.	Summer pruned. Root pruned.
5	Do.	Summer pruned. Root pruned.	10, 11	At discretion.	

The effect of severe pruning as compared with light pruning on the crops of 1908 is shown in the following table, from which it will be observed that light pruning resulted in the larger yield for every variety with the exception of Allington Pippin and Williams' Bon Chretien. In these cases the total yield was too small to be of much value for comparative purposes. Of the varieties which produced good crops, Stirling Castle was the only one which did not show a decided balance in favour of light pruning.

Name of Variety.	Yield in lbs. from lightly pruned Bushes in 1908.	Yield in lbs. from severely pruned Bushes in 1908.
APPLES.—(Dessert)—		
Allington Pippin	2¼	5½
Beauty of Bath	3¼	1¼
Cox's Orange Pippin	61	20
Devonshire Quarrenden	9	½
King of the Pippins	78	28
Worcester Pearmain	18¼	1¾
(Culinary)—		
Bramley's Seedling	33	14
Ecklinville Seedling	74	30
Lane's Prince Albert	177½	78
Lord Suffield	32	6
Newton Wonder	87½	53
Stirling Castle	95	90
PEARS.—		
Catillac	—	—
Doyenne Boussoch	2¼	—
Louise Bonne de Jersey	5	4
Williams' Bon Chretien	¾	1½

All the bushes in the scheme to be root-pruned were root-pruned in 1907, two years after planting. The exact weights from the root-pruned trees, as compared with those from the bushes not so treated, were not recorded separately for the 1908 crop; but, comparing those varieties which bore well, there was clearly an appreciably heavier yield from the root-pruned bushes in the case of Cox's Orange Pippin, King of the Pippins, Newton Wonder, Worcester Pearmain, Stirling Castle, Lane's Prince Albert and Lord Suffield, especially in the case of the two first-mentioned varieties. The fruit itself also from the root-pruned trees was of much finer size and colour. Against this, however, must be set the fact that Newton Wonder, Lane's Prince Albert, Stirling Castle, and, especially, Lord Suffield, have been severely checked in growth by the root-pruning.

The scheme has not been sufficiently long in operation to exhibit marked results for the other points which are being tested, but it is expected that they will be forthcoming now in the course of a season or two.

A one-acre plantation, similar in every respect to that in which this scheme is being tested at the Institute, has been recently laid out at Droitwich, under the auspices of the Worcestershire Agricultural Education Committee, in which the same scheme of pruning experiments will be carried out. The comparative results obtained at the two stations under different climatic conditions and on different soils should be of considerable value.

Strawberry Runner Experiments.

Trials of the relative cropping qualities of the "first" and "second" runners of strawberry plants were started in 1906. By the term, "first" runner, is meant the first runner produced from parent plant on a given stem, while the "second" runner is the next produced on the same stem. The runners were obtained from plants growing in Plantation No. 1, the selection being made from those produced during the summer of 1906. The selected plants were allowed to root naturally in the usual way, and were severed from the parent and planted in rows in Plantation No. 2 in September, 1906. The trials were made on five varieties, viz., Sir Joseph Paxton, Royal Sovereign, Monarch, President, and Latest of All. Two hundred "first" and the same number of "second" runners of each variety were taken, making altogether eight rows of each variety. The varieties were arranged in the order given above, with four successive rows of the "first" runners, followed by four of the "seconds."

The crops for 1907 were small, the plants for the first season not being particularly strong, although, as might be expected, the "firsts" were the larger. In 1908, the yield was fair, considering the nature of the season; and the plants of the two groups were more even in size and strength. They will be fruited again in 1909, and possibly also in 1910, if the amount of space occupied by the bush fruits, among which they are interplanted, does not cause them to be crowded out.

The assertion by some growers that the "second" runners produce larger crops has not been supported by the results for the first two seasons, although possibly the third season's crop may result differently, since the "seconds" were originally the more backward plants, and may, therefore, take longer to reach full vigour.

The actual figures for each variety are given in the following table. It will be observed that the yields from President and Latest of All compare very unfavourably with those from the other varieties. This is due to the fact that those varieties are interplanted with raspberries, which have made very strong growth and have overshadowed the strawberries, while the other varieties are interplanted with gooseberries, which are still too small to exert any prejudicial effect.

Name of Variety.	Yield in lbs. from "First" Runners.	Yield in lbs. from "Second" Runners.
Royal Sovereign 1907	13½	7
Do. 1908	177¼	135¼
Sir Joseph Paxton 1907	24	17¼
Do. 1908	223½	240¾
Monarch 1907	5½	3
Do. 1908	138¼	121¾
President 1907	6½	4
Do. 1908	80¼	51
Latest of All 1907	½	½
Do. 1908	44	26¾
Total yield for 1907 and 1908	712¾	607¼

NOTES ON THE ORCHARDS, NURSERIES, AND PLANTATIONS.

The Young Orchard.—In some respects the growth of the trees has been more satisfactory than in any previous year. The trees have grown so rapidly in our good soil that the wood, being rather soft, has not been able to withstand attacks of canker and American blight, which are easily carried from the old orchard trees near. In the early spring of 1908 a dressing of fresh slaked lime was given to every tree, sufficient being applied to just cover the ground and then it was lightly forked in. This no doubt has to a great extent assisted in hardening the wood, and canker has given very little trouble. All the trees were sprayed with a winter wash of which several, both proprietary and home made, have been tried.

Very good crops were borne on several of the Herefords, especially Chisel Jersey, Medaille d'or, and Skyrme's Kernel. Of the others Strawberry Norman and Foxwhelp have given very little fruit so far. All the trees are of the same age, *i.e.*, nine years, and have now been planted five years.

The Old Orchard.—Many of the old trees have carried good, and some, heavy crops, but the names of most of them are quite unknown, so local names have simply been given to distinguish them. Some, although they are probably old seedlings and were never grafted, are very good dessert varieties, and others produce ciders well above the average for quality. The best of each will be tried on younger stocks.

The Nurseries.—The nursery, planted five years ago, has been considerably thinned in order to supply the 2,400 trees for the new experimental orchards. In addition, about 1,000 have been supplied to Members and Associates at the price of 2s. each, and more, about 200, to non-members at 2s. 6d. each. Members have been allowed to purchase at the reduced rate up to 100 trees each, and Associates up to 25 trees each. Another batch of trees will be ready for circulation next planting season from this nursery.

In the younger nursery, partly planted two years ago and partly last year, most of the stocks have been budded or grafted.

By the side of this nursery are the 600 dwarf trees, on the Paradise stock, to be drawn on eventually for a supply of grafts and fruit

for exhibition. The trees owing to the very hot summer did not make much growth but show fine flower buds for next season.

The Plantations.—The No. 1 Plantation, planted four years since, was given a dressing of lime, as were also the nursery and other plantations. Most of the varieties have carried good crops of very fine fruit. The King of the Pippins, Cox's Orange, Allington, and Worcester Pearmains were of exceptionally fine colour. Of the cooking varieties Lane's Prince Albert gave a heavy crop of first quality. Stirling Castle, Ecklinville Seedling, and Newton Wonder also gave a lot of fine fruit.

No. 2 Plantation, planted three and two years ago, has given us opportunities for trying various washes on various pests. Several of the varieties of Black Currants were attacked by big bud, although all the trees were apparently clean when planted. The varieties infested were cut back very hard, any odd big buds were removed, and the bushes were sprayed in the winter.

This was followed up in April, about the first and third weeks respectively, by spraying with a mixture of two ounces each methylated spirit and soft soap, and half an ounce of liver of sulphur to one gallon of water. Very few big buds were formed this season, so by carefully removing these and spraying again in April it is hoped to get rid of them entirely. Two varieties, so far as we can see at present, have been mite-proof. They are Boskoop Giant and Ogden's Prolific Black.

Some of the Gooseberries were attacked by the fungus, *Glœosporium ribis*. To cure this, and also to prevent attacks of Gooseberry Caterpillar, the bushes were sprayed with Bordeaux Mixture soon after the fruit had commenced swelling.

A sharp frost just while the trees were in flower destroyed a good deal of the crop, but enough was left to give a fairly good return, and the fruit was very good in quality.

APPENDIX A.—The Characters of Single Variety Ciders made in 1907-8.

Name of Variety.	Date of Making.	Specific Gravity.	Percentage Composition of Juice.		Specific Gravity June 2, 1908.	Remarks on Characters of Ciders.
			Malic Acid.	Tannin.		
Sharp Varieties.						
BLOODY BUTCHER .. (Somerset)	Dec. 10, 1907	1.056	.92	.136	1.002	A very sharp, dry cider; thin, but of fair and very clean flavour, and pleasant aroma. Fermented rather rapidly. Useful for blending.
BRUFORD'S No. I. .. (Somerset)	Jan. 17, 1908	1.057	.55	.104	1.002	A medium brisk, dry cider of average quality. Aroma and flavour fair. Fermented rapidly. Can be used alone or for blending.
DAGG'S APPLE .. .. (Somerset)	Jan. 31, 1908	1.044	.56	.094	1.001	A medium brisk, dry cider of poor quality. Flavour and aroma somewhat coarse, and rate of fermentation rapid. Can be used alone or blended, but is lacking in quality.
LAMBROOK PIPPIN .. (Somerset)	Jan. 18, 1908	1.053	.58	.216	1.002	A medium brisk, dry cider. Flavour and aroma very clean and pleasant. Rate of fermentation slow. Well suited for use alone, and easily retained sweet by filtration.
NEVERBLIGHT .. .. (Somerset)	Dec. 14, 1907	1.040	.62	.232	.999	A somewhat sharp, dry cider of pleasant aroma and fair flavour. Rate of fermentation rather rapid. Can be used alone or blended, with fairly satisfactory results as regards flavour and aroma for dry ciders, but the quality of the juice is too low for the variety to take a high place.
ROUGE DE TREVES .. (Somerset)	Jan. 31, 1908	1.049	.70	.094	1.002	A sharp, dry cider. Flavour clean, but rather hard and coarse; aroma fair. Rate of fermentation rapid. Of moderate service for blending for dry ciders.
SLATTER'S No. I. .. (Worcester)	Dec. 4, 1907	1.043	.85	.090	1.001	A very sharp, dry cider of second-rate quality. Rate of fermentation rapid. Only suited for blending for dry ciders.

SLATTER'S No. II. (Worcester) ..	Jan. 17, 1908	1.047	.53	.096	.999	A medium brisk, dry cider. Flavour and aroma clean and pleasant. Fermented rather rapidly. The variety produces a useful dry cider alone or blended, but cannot be considered of high rank owing to the low quality of the juice.
Sweet Varieties.						
BRUFORD'S No. II. (Somerset) ..	Jan. 17, 1908	1.057	.36	.100	1.000	A dry cider, slightly brisk in character. Flavour clean and fairly pleasant, but inclined to be coarse. Aroma fair. Rate of fermentation rapid. Adapted for use alone to produce a dry cider, but somewhat lacks body and quality of flavour.
CREMIERE .. .. .. (Somerset)	Jan. 31, 1908	1,052	.24	.130	1.000	A dry cider, somewhat lacking in briskness. Flavour and aroma clean and fairly pleasant. Rate of fermentation rather rapid. Gives better results blended than alone.
DOUX AMER .. .. (Somerset)	Jan. 13, 1908	1.049	.23	.108	—	Very similar in character to the preceding, but hardly so full flavoured.
ECARLATINE .. .. (Somerset)	Jan. 18, 1908	1.050	.12	.106	1.000	A dry cider of good quality, but lacking briskness. Flavour clean, pleasant and full; aroma pleasant. Rate of fermentation moderately rapid. A useful variety for blending, but rather insipid for use alone.
HARDING'S APPLE .. (Somerset)	Dec. 19, 1907	1.036	.20	.176	1.002	A dry, insipid cider, lacking in strength and quality. Flavour and aroma clean, but characterless. Rate of fermentation rather rapid. The extremely low quality of the juice renders the variety of little value.
HEBDITCH'S LONG NOSE (Somerset)	Nov. 26, 1907	1.056	.16	.084	1.008	A medium dry cider of fair quality, but lacking somewhat in character. Rate of fermentation rather slow. Can be used alone or, preferably, blended for the production of sweet ciders.
POMMIER BEDAN .. (Somerset)	Jan. 31, 1908	1.052	.18	.170	1.001	A clean, full flavoured, rather coarse, dry cider, lacking in acidity. Aroma and flavour fair. Rate of fermentation moderately rapid. Can be used alone or blended.
POMMIER BINET GRIS. .. (Somerset)	Jan. 31, 1908	1.054	.20	.180	1.000	Of the same general character as the preceding. Perhaps slightly fuller in flavour.

APPENDIX A.—The Characters of Single Variety Ciders made in 1907-8.

Name of Variety.	Date of Making.	Specific Gravity.	Percentage Composition of Juice.		Specific Gravity June 2, 1908.	Remarks on Characters of Ciders.
			Malic Acid.	Tannin.		
Bitter-Sweet Varieties.						
ASHTON BITTER WHITE (Somerset)	Oct. 18, 1907	1.051	.18	.350	—	A clean, pleasant flavoured, medium dry cider of very fair quality, but rather deficient in body. Aroma very fair. Rate of fermentation moderate. Useful for blending; but slightly too bitter for use alone.
ASHTON EARLY RED JERSEY (Somerset)	Oct. 18, 1907	1.055	.16	.330	—	A cider of similar character to the preceding, with the bitterness rather more sharply defined, and of characteristic flavour. Useful for blending.
ASHTON WHITE .. .. (Somerset)	Oct. 18, 1907	1.053	.22	.420	—	Of the same general character as Ashton Bitter White.
CARDIVE FORESTIER .. (Somerset)	Jan. 17, 1908	1.052	.28	.550	1.004	A medium dry cider of pronounced bitter taste. Flavour and aroma fairly good, but rather coarse. Rate of fermentation moderately rapid. Fairly useful for blending.
GLASTONBURY .. .. (Somerset)	Dec. 19, 1907	1.045	.22	.244	1.000	A dry, slightly bitter cider of rather coarse character. Flavour and aroma inferior. Can be used for blending, but is deficient in quality.
ITALY (*syn.* Cherry Norman) (Worcester)	Jan. 17, 1908	1.052	.37	.340	1.002	A rather bitter, dry, full-bodied cider. Flavour and aroma fair. Rate of fermentation moderately rapid. Useful for blending.
LEA'S No. I. .. .. (Worcester)	Nov. 23, 1907	1.074	.32	.262	—	A strong, full-bodied dry cider of good quality with a trace of bitterness. Aroma and flavour well marked and pleasant. Rate of fermentation moderate. A very useful variety for blending on account of the high quality of the juice. Somewhat too bitter for use alone.

MEDAILLE D'OR .. .. (Somerset)	Dec. 4, 1907	1.056	.22	.244	1.005	A rather strong, full bodied, medium dry cider. Flavour pleasant, but markedly bitter, although not to such an extent as usual with this variety. Aroma very fair. Rate for fermentation slow. Useful for blending, when used in small quantities; but the bitterness is too pronounced for use in large proportions.
MONS. JACQUES .. .. (Somerset)	Jan. 31, 1908	1.051	.28	.416	1.008	A similar cider to the preceding, but somewhat sweeter, and with slightly more marked bitterness. Aroma very fruity. Rate of fermentation slow. Useful for bending in limited proportions.
REINE DES POMMES .. (Somerset)	Jan. 31, 1908	1.061	.21	.418	1.005	Similar to Medaille d'Or in general character. Juice of good quality.
WHEELER'S No. I. .. (Worcester.)	Jan. 18, 1908	1.052	.24	.268	1.001	A dry cider of moderate quality with slight bitter flavour. Aroma fair. Rate of fermentation rapid. Can be used for blending, but of second-rate quality only.

Name of Variety.	Number of Tree.	Specific Gravity of Juice.	Percentage Composition of Juice.		Remarks on Treatment of Tree, &c.
			Malic Acid.	Tannin.	
CAP OF LIBERTY	1	1.063	.76	.210	Head-grafted on King of Pippins stock in 1906. Grass removed within radius of 4ft. 6in. around tree.
Ditto	2	1.060	.80	.252	Head-grafted on King of Pippins stock in 1906. Grass removed within 3ft. radius around tree.
Ditto.	4	1.068	.92	.198	Head-grafted on King of Pippins stock in 1906. Grass removed within 4ft. 6in. radius around tree.
Ditto.	5	1.061	.78	.208	Head-grafted on King of Pippins stock in 1906. Grass removed within 3ft. radius around tree.
CHISEL JERSEY ..	1	1.056	.18	.382	Grass removed within radius of 4ft. 6in. around tree.
Ditto.	2	1.066	.18	.454	Grass removed within radius of 3ft. around tree.
Ditto.	3	1.070	.27	.540	Grass allowed to grow to base of tree.
Ditto.	4	1.063	.28	.384	As Tree 2, but the variety in this instance head-grafted on a standard crab stock.
Ditto.	5	1.056	.23	.420	As Tree 2.
EGGLETON STYRE	5	1.056	.28	.158	Grass removed within radius of 3ft. around tree.
Ditto.	7	1.060	.25	.156	Grass removed within radius of 4ft. 6in. around tree.
Ditto.	9	1.065	.28	.196	As Tree 5.
KINGSTON BLACK	1	1.069	.41	.302	Grass removed within radius of 4ft. 6in. around tree.
Ditto.	2	1.080	.59	.372	Grass removed within radius of 3ft. around tree.
MEDAILLE D'OR ..	1	1.076	.31	.940	Grass removed within radius of 4ft. 6in. around tree.
Ditto.	2	1.070	.29	.664	Grass removed within radius of 3ft. around tree.
Ditto.	3	1.076	.26	.564	Grass allowed to grow to base of tree.
Ditto.	4	1.072	.32	.864	As Tree 1.
Ditto.	6	1.069	.28	.566	As Tree 1.
Ditto.	7	1.071	.27	.730	As Tree 1.
Ditto.	9	1.081	.36	.392	As Tree 2.
REINETTE OBRY	1	1.058	.86	.154	Head-grafted on Morgan Sweet stock in 1905. Grass removed within 4ft. 6in. radius of tree.
Ditto.	3	1.058	.80	.136	Head-grafted on Morgan Sweet stock in 1905. Grass allowed to grow to base of tree.
SKYRME'S KERNEL	1	1.060	.57	.228	Grass removed within 4ft. 6in. radius of base of tree.
Ditto.	2	1.059	.54	.198	Grass removed within 3ft. radius of base of tree.

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.			Grower.	District.	
		Total Sugar. Approximate.	Malic Acid.	Tannin.			
APPLES.							
ANSELL	1.064	13.5 —15.5	.48	.166	J. Mayo	Dymock	G.
APPLERIDGE PIPPIN	1.063	13.25 15.25	.22	.314	A. T. Price	Berkeley	G.
ASHTON BITTER WHITE ..	1.050	10 —12	.17	.552	Cider Institute ..	Long Ashton	
ASHTON BROWN JERSEY ..	1.051	10.25—12.25	.18	.124	Ditto	Ditto	
ASHTON EARLY RED JERSEY	1.050	10 —12	.17	.480	Ditto	Ditto	
ASHTON No. 5	1.051	10.25—12.25	.35	.284	Ditto	Ditto	
Do. No. 30	1.055	11.25—13.25	1.03	.404	Ditto	Ditto	
Do. No. 35	1.064	13.5 —15.5	.91	.244	Ditto	Ditto	
Do. No. 36	1.054	11 —13	.29	.312	Ditto	Ditto	
Do. No. 46	1.050	10 —12	.17	.480	Ditto	Ditto	
Do. No. 47	1.046	9 —11	.80	.156	Ditto	Ditto	
Do. No. 48	1.063	13.25—15.25	1.62	.476	Ditto	Ditto	
Do. No. 58	1.052	10.5 —12.5	1.01	.452	Ditto	Ditto	
Do. No. 59	1.067	12.25—16.25	.75	.166	Ditto	Ditto	
Do. No. 60	1.051	10.25—12.25	.26	.214	Ditto	Ditto	
Do. No. 66	1.052	10.5 —12.5	.21	.700	Ditto	Ditto	
Do. No. 67	1.060	12.25—14.25	.79	.214	Ditto	Ditto	
Do. No. 68	1.053	10.75—12.75	.19	.610	Ditto	Ditto	
Do. No. 78	1.060	12.25—14.25	.50	.234	Ditto	Ditto	
Do. No. 83	1.050	10 —12	.17	.552	Ditto	Ditto	
Do. No. 87	1.043	8.25—10.25	.81	.184	Ditto	Ditto	
Do. No. 90	1.045	8.75—10.75	.75	.150	Ditto	Ditto	
Do. No. 95	1.056	11.5 —13.5	.90	.208	Ditto	Ditto	
Do. No. 102	1.065	13.75—15.75	.18	.680	Ditto	Ditto	
Do. No. 123	1.057	11.75—13.75	.98	.182	Ditto	Ditto	

APPENDIX C.—Analyses of Apples and Pears, 1908-9.—*continued.*

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice. Total Sugar. Approximate.	Malic Acid.	Tannin.	Grower.	District.
APPLES—*continued.*						
ASHTON No. 125	1.065	13.75—15.75	.45	.162	Ditto	Ditto
Do. No. 130	1.061	12.75—14.75	.50	.124	Ditto	Ditto
Do. No. 141	1.057	11.75—13.75	.96	.306	Ditto	Ditto
Do. No. 143	1.057	11.75—13.75	1.12	.286	Ditto	Ditto
Do. No. 144	1.084	18.5 —20.5	1.33	.262	Ditto	Ditto
Do. No. 156	1.057	11.75—13.75	.74	.240	Ditto	Ditto
Do. No. 162	1.057	11.75—13.75	.47	.132	Ditto	Ditto
Do. No. 185	1.066	14 —16	.65	.348	Ditto	Ditto
Do. No. 187	1.067	14.25—16.25	.71	.272	Ditto	Ditto
Do. No. 190	1.048	9.5 —11.5	.45	.108	Ditto	Ditto
Do. No. 193	1.071	15.25—17.25	1.65	.490	Ditto	Ditto
Do. No. 204	1.060	12.5 —14.5	.42	.106	Ditto	Ditto
Do. No. 206	1.057	11.75—13.75	.53	.154	Ditto	Ditto
ASHTON RUSSET JERSEY ..	1.055	11.25—13.25	.22	.288	Ditto	Ditto
ASHTON WHITE	1.050	10—12	.29	.366	Ditto	Ditto
BACKWELL RED	1.051	10.25—12.25	.56	.050	G. R. Horler	Backwell S.
BELLE NORMAN	1.048	9.5 —11.5	.22	.250	J. Howells	Cwmcarvon M.
BERKELEY PIPPIN	1.056	11.5 —13.5	.46	.144	W. E. King	Berkeley G.
BRAN ROSE	1.054	11 —13	.35	.166	O. Hawkins	Forthampton W.
BROADLEAF HEREFORD ..	1.070	15 —17	.27	.520	R. Neville Grenville	Butleigh S.
BROADLEAF NORMAN ..	1.058	12 —14	.19	.310	Cider Institute	Long Ashton S.
BROAD STYRE	1.053	10.75—12.75	.77	.096	J. Howells	Cwmcarvon M.
BROMLEY	1.054	11 —13	.85	.108	O. Hawkins	Forthampton G.
BROWN SNOUT	1.057	11.75—13.75	.29	.234	J. Child	Withington H.
BUCK'S KERNEL	1.052	10.5 —12.5	.60	.116	H. Bennett	Falfield C.

BULMER'S SEEDLING							
BITTERSWEET ..	1.056	11.5 — 13.5	.19	.130	H. P. Bulmer	Hereford	H.
BUNCH JERSEY	1.049	9.75 — 11.75	.186	.092	R. Neville Grenville ..	Butleigh	S.
BUTLEIGH No. 2 (COOK'S) ..	1.074	16 — 18	.21	.820	Ditto	Ditto	
Do. No. 14	1.098	22 — 24	.10	.420	Ditto	Ditto	
Do. No. 66	1.056	11.5 — 13.5	.15	.308	Ditto	Ditto	
Do. No. 69	1.069	14.75 — 16.75	.60	.276	Ditto	Ditto	
Do. No. 72	1.066	14 — 16	.52	.384	Ditto	Ditto	
CADBURY	1.061	12.75 — 14.75	.22	.238	W. E. King	Berkeley	G.
CAP OF LIBERTY	1.075	11.75 — 13.75	.86	.168	J. H. Symes	Martock	S.
Do.	1.064	13.5 — 15.5	.86	.264	R. Neville Grenville ..	Butleigh	S.
CAROLINE	1.052	10.5 — 12.5	.72	.094	Capt. Crawshay ..	Norwich	Nor.
CHERRY NORMAN	1.048	9.5 — 11.5	.17	.276	E. G. Shew	Bosbury	H.
Do. Do.	1.055	11.25 — 13.25	.21	.354	E. V. V. Wheeler ..	Newnham	W.
Do. Do.	1.056	11.5 — 13.5	.22	.288	E. G. Shew	Bosbury	H.
CHISEL JERSEY	1.054	11 — 13	.23	.244	J. H. Symes	Martock	S.
COURT DE WICK	1.079	17.25 — 19.25	.29	.104	R. Shatford	Wick	G.
COURT ROYAL	1.058	12 — 14	.16	.116	R. Neville Grenville ..	Butleigh	S.
COURT ROYAL	1.051	10.25 — 12.25	.14	.120	Cider Institute ..	Long Ashton	S.
COWARNE RED	1.049	9.75 — 11.75	.65	.162	Ditto	Ditto	
CRAWSHAY'S No. 1	1.051	10.25 — 12.25	.52	.096	Capt. Crawshay ..	Norwich	Nor.
Do. No. 7	1.047	9.25 — 11.25	.56	.086	Ditto ..	Ditto	
CREMIERE	1.070	15 — 17	.36	.960	Cider Institute ..	Long Ashton	S.
CRIMSON KING	1.045	8.75 — 10.75	.58	.108	H. Wardlaw	Sherborne	Dor.
CUMMY NORMAN	1.061	12.75 — 14.75	.27	.252	E. G. Shew	Bosbury	H.
EASTHAM	1.065	13.75 — 15.75	.23	.206	Rev. E. E. Lea ..	Eastham	W.
FOREST STYRE	1.077	16.75 — 18.75	1.44	.244	T. Garland	Aylburton	G.
FOXWHELP	1.072	15.5 — 17.5	.64	.326	R. Neville Grenville ..	Butleigh	S.
Do.	1.059	12.25 — 14.25	1.04	.270	T. H. Pretty ..	Shirehampton	G.
FREDERICK	1.046	9 — 11	.71	.108	J. Howells	Cwmcarvon	M.
GOLDEN CIDER RUSSET ..	1.065	13.75 — 15.75	.63	.164	C. Osborn	Woolston	S.
GREASY PIPPIN	1.057	11.75 — 13.75	.65	.172	T. A. May	Staplegrove	S.
HACKETT'S KERNEL	1.050	10 — 13	.72	.092	J. Mayo	Dymock	G.
HALCOMBE	1.068	14.5 — 16.5	.14	.324	R. Neville Grenville ..	Butleigh	S.

APPENDIX C.—Analyses of Apples and Pears, 1908-9.—*continued.*

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.		Grower.	District.	
		Total Sugar. Approximate.	Malic Acid.	Tannin.			
APPLES—*continued.*						
HAWTHORNDENE	1.042	8 —10	.54	.118	Capt. Crawshay ..	Norwich	Nor.
IMPROVED KINGSTON BLACK	1.056	11.5 —13.5	.71	.164	R. Neville Grenville ..	Butleigh	S.
IMPROVED POUND	1.047	9.25—11.25	.22	.090	G. D. Templeman ..	Hambridge	S.
KENTISH PIPPIN	1.050	10 —12	.59	.130	Capt. Crawshay ..	Norwich	Nor.
KING'S No. 1.	1.076	16.5 —18.5	.17	.538	W. E. King	Berkeley	G.
Do. No. 2	1.069	14.75—16.75	1.02	.132	Ditto	Ditto	
Do. No. 3	1.006	14 —16	.66	.084	Ditto	Ditto	
Do. No. 4	1.067	14.25—16.25	.52	.114	Ditto	Ditto	
Do. No. 5	1.066	14 —16	.26	.136	Ditto	Ditto	
KINGSTON BLACK	1.074	16 —18	.60	.264	Earl Beauchamp ..	Madresfield	W.
Do. Do.	1.058	12 —14	.53	.186	E. V. V. Wheeler ..	Newnham	W.
Do. Do.	1.066	14 —16	.65	.186	J. Goodlock	Corse Lawn	H.
Do. Do.	1.064	13.5 —15.5	.62	.196	T. Jeffs	Pendock	W.
Do. Do.	1.060	12.5 —14.5	.89	.122	R. Adams	Kingston Seymour	S.
Do. Do. (1st Sample) ..	1.064	13.5 —15.5	.52	.126	J. H. Symes	Martock	S.
Do. Do.	1.056	11.5 —13.5	.46	.116	G. E. Taverner.. ..	Budlake	D.
Do. Do.	1.058	12 —14	.41	.138	T. A. May	Staplegrove	S.
Do. Do.	1.070	15 —17	.56	.192	C. E. J. Walkey ..	Edgborough	S.
Do. Do.	1.069	14.75—16.75	.57	.254	J. Watts..	Backwell	S.
Do. Do. (1st Sample) ..	1.062	13 —15	.76	.272	Cider Institute	Long Ashton	S.
Do. Do.	1.050	10 —12	.44	.152	W. Hunt	Easton-in-Gordano	S.
Do. Do.	1.060	12.5 —14.5	.50	.142	H. Wardlaw	Sherborne	Dor.
Do. Do. (2nd Sample) ..	1.071	15.25—17.25	.67	.192	J. H. Symes	Martock	S.
Do. Do.	1.066	14 —16	.39	.172	W. E. King	Berkeley	G.
Do. Do.	1.075	16.25—18.25	.50	.254	R. Harding	Long Ashton	S.

KINGSTON BLACK	1.068	14.5 —16.5	.44	.242	J. S. Smyth Osbourne ..	Ash	D.
Do. Do.	1.071	15.25— 17.25	.56	.140	A. Brown	Failand	
Do. Do. (1st Sample) ..	1.068	14.5 —16.5	.55	.258	H. J. Davis	Sutton Montis	S.
Do. Do. (2nd Sample) ..	1.064	13.5 —15.5	.42	.218	Ditto	Ditto	S.
Do. Do. (2nd Sample) ..	1.065	13.75— 15.75	.62	.198	Cider Institute	Long Ashton	S.
Do. Do.	1.070	15 - 17	.45	.222	R. Neville Grenville ..	Butleigh	S.
Do. Do.	1.073	15.75 17.75	.47	.242	C. Osborn	Woolston	S.
Do. Do.	1.064	13.5 —15.5	.42	.184	G. Batten	Pensford	S.
Do. Do.	1.071	15.25— 17.25	.51	.186	J. Batten	Ditto	
Do. Do.	1.065	13.75 -15.75	.45	.258	C. Veads	Ditto	
Do. Do.	1.061	12.75— 14.75	.48	.228	W. Davies	Ditto	
KNOTTED KERNEL	1.052	10.5 - 12.5	.21	.334	J. Helme	Norton Canon	H.
Do. Do.	1.075	16.25— 18.25	.12	.156	Cider Institute	Long Ashton	S.
LADY'S FAVOURITE	1.066	14 - 16	.67	.168	R. Neville Grenville ..	Butleigh	S.
LADY'S FINGER	1.054	11 —13	.52	.094	Cider Institute	Long Ashton	S.
LAMBROOK PIPPIN	1.054	11 —13	.50	.196	J. H. Symes	Martock	S.
LATE SOUR CADBURY ..	1.069	14.75— 16.75	.64	.184	C. Osborn	Woolston	S.
LORAM'S SWEET WHITE ..	1.056	11.5 —13.5	.21	.140	E. T. Loram	Alphington	D.
MIDDLE MILL BRANDY ..	1.048	9.5 —11.5	.59	.178	A. T. Price	Berkeley	G.
MOBLEY'S SOURING	1.052	10.5 12.5	.87	.160	W. E. King	Berkeley	G.
MONEY COUTTS' No. 1 ..	1.052	10.5 - 12.5	.50	.144	H. B. Money-Coutts ..	Tiverton	D.
Do. No. 2 ..	1.055	11.25- 13.25	.88	.186	Ditto	Ditto	
Do. No. 3 ..	1.051	10.25—12.25	.40	.116	Ditto ..	Ditto	
Do. No. 4 ..	1.050	10 —12	.64	.182	Ditto	Ditto	
Do. No. 5 ..	1.053	10.75—12.75	.68	.188	Ditto	Ditto	
Do. No. 6 ..	1.070	15 —17	1.27	.137	Ditto	Ditto	
Do. No. 7 ..	1.058	12 —14	.16	.264	Ditto	Ditto	
Do. No. 8 ..	1.047	9.25—11.25	.62	.088	Ditto	Ditto	
Do. No. 9 ..	1.052	10.5 —12.5	.20	.144	Ditto	Ditto	
Do. No. 10 ..	1.045	8.75—10.75	.54	.274	Ditto	Ditto	
Do. No. 11 ..	1.048	9.5 —11.5	.49	.136	Ditto	Ditto	
Do. No. 12 ..	1.054	11 —13	.64	.184	Ditto	Ditto	
Do. No. 13 ..	1.049	9.75—11.75	.89	.146	Ditto	Ditto	
Do. No. 14 ..	1.048	9.5 —11.5	.70	.188	Ditto	Ditto	

APPENDIX C.—Analyses of Apples and Pears, 1908-9.—*continued*

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.			Grower.	District.
		Total Sugar. Approximate.	Malic Acid.	Tannin.		
APPLES—*continued.*						
MORGAN SWEET	1.055	11.25—13.25	.11	.138	Cider Institute	Long Ashton S.
NEVER-DECEIVE-ME	1.067	14.25—16.25	.16	.202	R. Neville Grenville ..	Butleigh S.
NEW CADBURY	1.059	12.25—14.25	.15	.264	Ditto	Ditto
NEWCOMEN'S No. 1	1.061	12.75—14.75	1.10	.262	T. Newcomen	Coleford G.
NEW FOXWHELP	1.065	13.75—15.75	1.14	.379	Earl Beauchamp ..	Madresfield W.
OLD CADBURY	1.071	15.25—17.25	.12	.240	R. Neville Grenville ..	Butleigh S.
OVERTON RED	1.058	12 —14	.47	.062	J. Fowler	Tirley W.
PAGE'S YELLOW	1.055	11.25—13.25	.68	.178	T. Garland	Aylburton G.
PASSEY'S LATE CRAB ..	1.043	8.25—10.25	.70	.124	A. E. Passey	Twyning G.
PASSEY'S RED	1.041	7.75— 9.75	.00	.028	Ditto	Ditto
POLE-CAREW'S No. I	1.047	9.25—11.25	.19	.158	C. E. Pole-Carew ..	Littlehampton D.
Do. No. II. ..	1.061	12.75—14.75	.21	.298	Ditto	Ditto
Do. No. III. ..	1.065	13.75—15.75	.62	.182	Ditto	Ditto
Do. No. IV. ..	1.046	9—11	.15	.138	Ditto	Ditto
Do. No. XII. ..	1.063	13.25—15.25	.52	.184	Ditto	Ditto
POMEROY	1.047	9.25—11.25	.47	.086	C. E. Vowles	Whitchurch S.
PRINCE ALBERT	1.049	9.75—11.75	.21	.244	J. Shipp	Falfield G.
PRINCE OF WALES' CRAB ..	1.050	10 —12	.89	.178	Cider Institute	Long Ashton S.
RED GEORGE	1.054	11 —13	1.31	.116	J. Brock	Long Ashton S.
RED NORMAN	1.051	10.25—12.25	.15	.296	E. V. V. Wheeler ..	Newnham W.
RED SOLDIER	1.061	12.75—14.75	1.01	.288	O. Hawkins	Forthampton G.
REDSTREAK	1.055	11.25—13.25	.99	.152	Ditto	Ditto
Do.	1.055	11.25—13.25	.86	.150	Earl Beauchamp ..	Madresfield W.
RED VALLIS	1.047	9.25—11.25	.18	.094	W. E. King	Berkeley G.
REYNOLDS' KERNEL ..	1.041	7.75— 9.75	.80	.056	E. Edgewick	Tewkesbury G.

ROLLAND	1.051	10.25—12.25	.87	.136	Capt. Crawshay	Norwich Nor.
ROYAL JERSEY	1.070	15 —17	.16	.384	R. Neville Grenville	Butleigh S.
Do. Do.	1.053	10.75—12.75	.17	.272	J. H. Symes	Martock S.
ROYAL WILDING	1.064	13.5 – 15.5	.24	.322	E. G. Shew	Bosbury H.
SHARPE'S MIDSUMMER	1.054	11 —13	.83	.084	Cider Institute	Long Ashton S.
SHATFORD'S No. 1	1.050	10 —12	.50	.076	R. Shatford	Wick G.
Do. No. 2	1.072	15.2 —17.5	.92	.088	Ditto	Ditto
Do. No. 3	1.056	11.5 —13.5	.79	.036	Ditto	Ditto
Do. No. 4	1.076	16.5 —18.5	.64	.094	Ditto	Ditto
SILVER CUP	1.067	14.25—16.25	.15	.336	M. Morrish	N. Cadbury S.
SKRYME'S KERNEL	1.068	14.5 —16.5	.57	.112	O. Hawkins	Forthampton G.
Do. Do.	1.065	13.75 – 15.75	.72	.184	E. Edgewick	Tewkesbury G.
SLACK-MA-GIRDLE	1.049	9.75 – 11.75	.19	.116	E. T. Loram	Alphington D.
SMYTH OSBOURNE'S No. 2	1.061	12.75– 14.75	.24	.438	J. S. Smyth Osbourne	Ash D.
Do. No. 3	1.058	12 —14	.21	.224	Ditto	Ditto
Do. No. 4	1.051	10.25—12.25	.22	.272	Ditto	Ditto
Do. No. 6	1.049	9.75—11.75	.16	.246	Ditto	Ditto
SPREADING NORMAN	1.058	12 —14	.20	.426	E. G. Shew	Bosbury H.
STRAWBERRY NORMAN	1.057	11.75—13.75	.27	.254	Ditto	Ditto
SWEET ALFORD	1.049	9.75—11.75	.16	.110	E. T. Loram	Alphington D.
SWEET HOARY MORNING	1.052	10.5 - 12.5	.20	.142	J. S. Smyth Osborne	Ash D.
TANNERS	1.073	15.75—17.75	.17	.840	R. Neville Grenville	Butleigh S.
TOWER OF GLAMIS	1.049	9.75—11.75	.45	.140	Capt. Crawshay	Norwich Nor.
TREMLITT'S BITTER	1.046	9 —11	.21	.266	G. E. Taverner	Budlake D.
TWISTBODY JERSEY	1.062	13 —15	.25	.328	R. Neville Grenville	Butleigh S.
UNDERLEAF	1.048	9.5 —11.5	.78	.092	O. Hawkins	Forthampton G.
VALLIS	1.057	11.75—13.75	.17	.196	C. E. Vowles	Whitchurch S.
VOWLES' No. 1	1.034	6 — 8	.12	.064	Ditto	Ditto
WARDLAW'S No. 1	1.064	13.5 —15.5	.28	.462	H. Wardlaw	Sherborne D.
WHEELER'S No. 1	1.046	9 —11	.17	.258	E. V. V. Wheeler	Newnham W.
WHITE JERSEY	1.060	12.5 —14.5	.28	.232	B. Chiffers	Glastonbury S.
WHITE NORMAN	1.061	12.75—14.75	.22	.580	E. V. V. Wheeler	Newnham W.
WINTER QUARRENDEN	1.049	9.75—11.75	.65	.146	C. Osborn	Woolston S.
YARLINGTON MILL JERSEY	1.050	10 —12	.24	.308	Ditto	Ditto

APPENDIX C.—Analyses of Apples and Pears, 1908-9.—*continued.*

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.			Grower.	District.
		Total Sugar. Approximate.	Malic Acid.	Tannin.		
APPLES—*continued.*						
YELLAND No. 1	1.048	9.5 —11.5	.29	.144	G. D. Yelland	Nethercott D.
YELLOW STYRE	1.060	12.5 —14.5	.83	.068	O. Hawkins	Forthampton G.
Do. Do.	1.064	13.5 —15.5	.56	.178	T. Garland	Aylburton G.
PEARS.						
BARLAND	1.056	11.5 —13.5	.36	.026	E. V. V. Wheeler ..	Newnham W.
BLAKENEY RED	1.047	9.25—11.25	.48	.088	A. T. Price	Berkeley G.
BROWN HUFFCAP	1.045	8.75—10.75	.50	.044	E. V. V. Wheeler ..	Newnham W.
BUTT	1.057	11.75—13.75	.58	.140	E. Edgwick	Tewkesbury G.
OLDFIELD	1.057	11.75—13.75	.48	.032	Cider Institute	Long Ashton S.
Do.	1.065	13.75—15.75	.83	.254	O. Hawkins	Forthampton G.
PINT	1.044	8.5 —10.5	.76	.074	J. Mayo	Dymock G.
RED	1.049	9.75—11.75	.32	.104	E. V. V. Wheeler ..	Newnham W.
RED LONGLAND	1.064	13.5 —15.5	.34	.056	Ditto	Ditto
YELLOW HUFFCAP	1.052	10.5 —12.5	.27	.020	Ditto	Ditto

APPENDIX D.—Small Fruit Returns from the Variety Trials in Plantations I. and II.

		Yield in lbs.		
		1908.	1907.	1906.
PLANTATION No. 1.				
STRAWBERRIES—				
Royal Sovereign ..	600 plants	—	260½	178½
Monarch ..	,, ..	—	169¼	278½
President ..	,, ..	—	244	236
Vicomtesse Hericart de Thury	,, ..	—	198	245
Noble ..	,, ..	—	73½	50
Waterloo ..	,, ..	—	17½	49½
Latest of All ..	,, ..	—	76½	194½
Sir Joseph Paxton ..	,, ..	—	51½	140
RASPBERRIES—				
Northumberland Fillbasket	180 plants	205¼	266½	100
Norwich Wonder ..	,, ..	162¼	274½	81
Hornet ..	,, ..	224½	244¼	72
Superlative ..	,, ..	128½	283¼	97
GOOSEBERRIES—				
Crown Bob ..	90 plants ..	50¼	197	40½
Keepsake ..	,, ..	177¼	313½	70
Lancashire Lad ..	,, ..	192	141	50
Whinham's Industry ..	,, ..	183½	133	69
BLACK CURRANTS—				
Baldwin's ..	90 plants ..	—	27	145
Carter's Champion ..	,, ..	—	56½	139
Lee's Prolific ..	,, ..	—	34	134
Black Naples ..	,, ..	—	40	149
RED CURRANTS—				
Fay's Prolific ..	90 plants ..	48½	126	30½
Knight's Sweet Red ..	,, ..	63	97	48
Raby Castle ..	,, ..	126½	92¾	28
WHITE CURRANTS—				
White Dutch ..	90 plants ..	92	155	103

APPENDIX D.—Small Fruit Returns from the Variety Trials in Plantations I. and II.—*continued.*

		Yield in lbs.		
		1908.	1907.	1906.
PLANTATION No. 11.—				
Raspberries—				
Red Antwerp ..	150 plants	141	30	—
Yellow Antwerp ..	,, ..	100¼	45¾	—
White Magnum Bonum	,, ..	89¾	55¼	—
Baumforth's Seedling ..	,, ..	114½	56¾	—
Abundance ..	,, ..	49¾	—	—
Semper Fidelis (*a*) ..	,, ..	99¼	55¾	—
Do. (*b*) ..	,, ..	44	—	—
Lord Beaconsfield ..	,, ..	115¼	—	—
Carter's Prolific.. ..	,, ..	78½	22¾	—
Gooseberries—				
Blucher ..	20 bushes	2½	6¼	—
Falstaff ..	,, ..	16	8¼	—
Early Sulphur ..	,, ..	7½	—	—
Leveller ..	,, ..	36¼	24¾	—
King of Trumps ..	,, ..	16	27½	—
Mount Pleasant ..	,, ..	9¾	4½	—
Faithful ..	,, ..	19	12¾	—
Surprise ..	,, ..	28½	25	—
Careless ..	,, ..	34	22¼	—
May Duke ..	,, ..	3½	7½	—
Telegraph ..	,, ..	14¾	17¾	—
Fascination ..	,, ..	27¼	22¼	—
Leader ..	,, ..	7¾	16¾	—
Red Warrington ..	,, ..	6¾	10	—
Transparent ..	10 bushes	6¾	—	—
High Sheriff ..	,, ..	4¾	3⅓	—
Hero of the Nile ..	,, ..	3¾	2¼	—
Ringer ..	,, ..	2¼	3½	—
Thatcher ..	,, ..	7	5¾	—
Victoria ..	,, ..	1	6	—
Langley Gage ..	,, ..	4	5¼	—
Gretna Green ..	,, ..	7¼	6¼	—
Diadem ..	,, ..	5¾	8¼	—
Red Champagne ..	,, ..	3½	2	—
Golden Gem ..	,, ..	5	5¼	—

APPENDIX E.

The Date of Blossoming of Varieties of Apples, Pears and Plums.

Records of the time of flowering of the different varieties of apples, pears and plums, grown at the Institute, were kept for the year 1908, and will in future be taken each season, since there are few statistics of the kind available for varieties grown at the same station, particularly in the case of the vintage fruit. The subject is of interest to the grower as indicating the relative possibility of danger from late frosts for the crops of those varieties. The dates given refer to those on which the earliest bloom was fully open.

Variety.	Date of Flowering.	Variety.	Date of Flowering.
APPLES.			
Market varieties.			
Stirling Castle	May 5.	Worcester Pearmain	May 11
Devonshire Quarrenden	„ 5	White Transparent	„ 11
Beauty of Bath	„ 6	King of the Pippins	„ 12
Sturmer Pippin	„ 9	Wealthy	„ 12
Lord Suffield	„ 10	James Grieve	„ 13
Ecklinville	„ 11	Cox's Orange Pippin	„ 13
Bramley's Seedling	„ 11	Lady Sudeley	„ 14
Lane's Prince Albert	„ 11	Royal Jubilee	„ 27
Cox's Orange Pippin	„ 11		
Vintage Varieties—			
Frequin Rouge	„ 11	Chevallier	„ 20
Reinette Obry	„ 11	Neverblight	„ 20
M. Jacques	„ 11	Kingston Black	„ 20
Court Royal	„ 12	Woolston Spice	„ 20
Ecarlatine	„ 12	White Close Pippin	„ 20
Eggleton Styre	„ 12	Hardwicke	„ 20
Cremiere	„ 13	White Bache	„ 21
Cardive Forestier	„ 13	Sandford Jersey	„ 21
Cap of Liberty	„ 14	Bedan des Parts	„ 21
Broadleaf Jersey	„ 15	Cherry Pearmain	„ 21
Doux Amer	„ 15	Bealy Down Pippin	„ 21
Davis' Crab	„ 15	Cherry Norman	„ 22
Sweet Alford	„ 15	White Jersey	„ 22
Bramtôt	„ 16	Brown Jersey	„ 22
Royal Jersey	„ 16	Dabinett	„ 22
Rowsie	„ 17	Skyrme's Kernel	„ 22
Chiffers'	„ 18	Dymock Red	„ 22
Yarlington Mill	„ 19	Rouge de Treves	„ 24
Redstreak	„ 19	Strawberry Norman	„ 27
Cowarne Red	„ 19	Foxwhelp	„ 28
Footlands No. 2	„ 20	Frequin Audievre	„ 29
Harry Masters	„ 20	Broadleaf Norman	„ 30
		Medaille d'Or	„ 31

APPENDIX E.—*continued.*

Variety.	Date of Flowering.	Variety.	Date of Flowering.
PEARS.			
Market Varieties—			
Louise Bonne de Jersey	April 22	Emile d'Heyst ..	May 1
Doyenne Boussoch ..	„ 28	Durondeau	„ 1
Williams' Bon Chretien	„ 30	Pitmaston Duchess ..	„ 2
Dr. Jules Guyot ..	May 1	Beurre d'Amanlis ..	„ 2
Conference	„ 1	Catillac	„ 3
Bellissime d'Hiver ..	„		
Vintage Varieties—			
Oldfield	„ 3		
Taynton Squash ..	„ 3		
Moorcroft	„ 6		
PLUMS.			
Mallard	April 19	Monarch	April 30
Early Prolific	„ 29	Denniston's Superb ..	„ 30
Czar	„ 30	President	May 1
Early Transparent ..	„ 30	Victoria	„ 1
Heron	„ 30	Belle de Louvain ..	„ 2

APPENDIX F.—New Experimental Orchards Planted in 1908-9.

CENTRE.	VARIETIES SELECTED.			
	APPLES.			PEARS.
	Sharp.	Sweet.	Bittersweet.	
Devon County Trees—				
Killerton	Cap of Liberty (8) Rouge de Treves (8)	Doux Amer (8) Improved Pound (8)	Medaille d'Or (8) Yarlington Mill (8)	
King's Nympton ..	Cherry Pearmain (8) Skyrme's Kernel (9)	Broadleaf Norman (10) Sweet Coppin (8)	Chisel Jersey (5) Knotted Kernel (10)	
Okehampton ..	Cowarne Red (5) Redstreak (5)	Broadleaf Norman (5) Cummy Norman (5)	Cherry Norman (5) Knotted Kernel (5)	
Ashprington ..	Foxwhelp (8) Hardwicke (8) Skyrme's Kernel (8)	Broadleaf Jersey (8) Bealy Down Pippin (8) Cremiere (8) Eggleton Styre (8) Ecarlatine (8)	Chisel Jersey (8) Harry Masters (8) Strawberry Norman (8) White Jersey (8)	
Gloucester County Trees.				
Hardwicke	Kingston Black (10) Skyrme's Kernel (10)	Ecarlatine (10) Eggleton Styre (10) Sweet Alford (10)	Cummy Norman (10) Medaille d'Or (10) Royal Wilding (10) Strawberry Norman (10)	Barland (5) Oldfield (5)
Lydney	Cowarne Red (10) Dymock Red (10) Foxwhelp (10)	Cremiere (10) Doux Amer (10) Sweet Coppin (10)	Chisel Jersey (10) Knotted Kernel (10) Yarlington Mill (10)	Moorcroft (5) Taynton Squash (5)
Berkeley	Cap of Liberty (10) Kingston Black (10)	Improved Pound (10) Eggleton Styre (10) Killerton Sweet (10) Sweet Alford (10)	Cherry Norman (10) Rouge Bruyere (10) Royal Jersey (10)	Barland (5) Moorcroft (5)

APPENDIX F.—New Experimental Orchards Planted in 1908-9.—*continued.*

CENTRE.	VARIETIES SELECTED.			
	APPLES.			PEARS.
	Sharp.	Sweet.	Bittersweet.	
Hereford County Trees.				
Hereford	Cap of Liberty (12) Cowarne Red (12) Dymock Red (12) Fair Maid of Devon (12) Foxwhelp (12) Hereford Redstreak (12) Kingston Black (12) Kingston Black Improved (12) Skyrme's Kernel (12)	Broadleaf Jersey (12) Broadleaf Norman (12) Court Royal (12) Eggleton Styre (12) Improved Pound (12) Killerton Sweet (12) Sweet Alford (12) Sweet Coppin (12)	Butleigh No. XIV. (12) Dabinett (12) Knotted Kernel (12) Medaille d'Or (12) No. 32 (12) Rouge de Bruyere (12) Somerset Redstreak (12) Yarlington Mill (12)	
Monmouth County Trees.				
Home Farm ..				Barland (13) Moorcroft (13) Oldfield (12) Taynton Squash (12)
Llantilio	Cowarne Red (12) Skyrme's Kernel (13) Kingston Black (13)	Cummy Norman (12)		
Llansaintfraed ..	Kingston Black (12) Redstreak (12)	Eggleton Styre (13)	Medaille d'Or (13)	
Treowen, Dingestow	Foxwhelp (13) Kingston Black (12)		Cherry Norman (12) Knotted Kernel (13)	
Itton	Cap of Liberty (13)	Eggleton Styre (13)	Knotted Kernel (12) Strawberry Norman (12)	
Tyllwyd, Llangwn ..	Cap of Liberty (12) Kingston Black (13)		Royal Jersey (12) White Jersey (13)	

Somerset County Trees.				
Barton St. Davids ..	Cowarne Red (10)	Broadleaf Norman (10)	Strawberry Norman (10	Barland (5)
	Hereford Redstreak (10)	Cummy Norman (10)		Moorcroft (5)
	Skyrme's Kernel (10)	Eggleton Styre (10)		Oldfield (5)
		Sweet Coppin (10)		Taynton Squash (5)
Clutton	Foxwhelp (10)	Cremiere (10)	Knotted Kernel (10)	Barland (5)
	Kingston Black (10)	Eggleton Styre (10)	Medaille d'Or (10)	Moorcroft (5)
	Neverblight (10)	Sweet Alford (10)		Oldfield (5)
				Taynton Squash (5)
East Compton ..	Foxwhelp (10)	Eggleton Styre (10)	Cherry Norman (19)	Barland (5)
	Hereford Redstreak (10)	Sweet Alford (10)	Knotted Kernel (10)	Moorcroft (5)
	Skyrme's Kernel (10)		Strawbery Norman (10)	Oldfield (5)
				Taynton Squash (5)
Worcester County Trees.				
Madresfield	Cap of Liberty (2)	Broadleaf Norman (2)	Cherry Norman (2)	Barland (2)
	Cherry Pearmain (2)	Court Royal (2)	Dabinett (2)	Butt (2)
	Cowarne Red (2)	Improved Pound (2)	Knotted Kernel (2)	Moorcroft (2)
	Dymock Red (2)	Killerton Sweet (2)	Medaille d'Or (2)	Oldfield (2)
	Fair Maid of Devon (2)	Sweet Alford (2)	Royal Bruyere (2)	Pine (2)
	Neverblight (2)	Sweet Coppin (2)	Strawberry Norman (2)	Taynton Squash (2)
	Skryme's Kernel (2)			
Moor	Cherry Pearmain (5)		Knotted Kernel (5)	Barland (5)
	Cowarne Red (5)		Royal Wilding (5)	Moorcroft (5)
	Foxwhelp (5)			Oldfield (5)
	Red Foxwhelp (5)			Taynton Squash (5)
Newnham		Broadleaf Jersey (10)	Knotted Kernel (10)	
		Broadleaf Norman (10)	Medaille d'Or (10)	
			Strawberry Norman(10)	
Powick	Foxwhelp (10)	Broadleaf Norman (5)	Knotted Kernel (10)	
	Hereford Redstreak (5)	Eggleton Styre (10)	Strawberry Norman(10)	
Upton-on-Severn ..	Kingston Black	Court Royal (10)	Harry Masters (10)	
	Neverblight (5)	Ecarlatine (5)	White Jersey (10)	
Wollas Hill	Foxwhelp (10)	Sweet Alford (5)		Barland (20)
	Skyrme's Kernel (10)			Oldfield (5)

APPENDIX F.—New Experimental Orchards Planted in 1908-9.—*continued.*

CENTRE.	VARIETIES SELECTED.			
	APPLES.			PEARS.
	Sharp.	Sweet.	Bittersweet.	
Bath and West Society's Butleigh (Somerset)..	*Trees.* Foxwhelp (5) Reinette Obry (5) Rouge de Treves (5)	Broadleaf Jersey (5) Cremiere (5) Doux Amer (6) Ecarlatine (4) Eggleton Styre (2)	Chisel Jersey (2) Dabinett (1) Medaille d'Or (2) Rouge Bruyere (6)	
Exeter (Devon) .	Hardwick (2)	Eggleton Styre (2)	Bramtót (2) Yarlington Mill (4)	
Hellens (Hereford) ..	Cap of Liberty (4) Cherry Pearmain (4) Foxwhelp (4) Skyrme's Kernel (4)	Cummy Norman (4) Eggleton Styre (4) Sweet Alford (4)	Butleigh No. XIV. (4) Knotted Kernel (4)	Hellens Green (2) Oldfield (4) Pine (4) Taynton Squash (4)
Sunny Bank, Rhiwderin (Monmouth)	Rouge de Treves (12)	Cremiere (12) Doux Amer (13) Ecarlatine (13)		
Woolston (Somerset)	Foxwhelp (10) .. Skyrme's Kernel (10)	Eggleton Styre (10)	Cardive Forestier (5) Major (5) Yarlington Mill (10)	
Board of Agriculture Trees Aspall (Suffolk) ..	Neverblight Skyrme's Kernel (5)	Eggleton Styre (5) Sweet Alford (5)	Knotted Kernel (5)	Barland (5) Moorcroft (5) Oldfield (10) Taynton Squash (5)
Croesheolydd, .. Bassaleg (Mon.)	Fair Maid of Devon (13)	Sweet Alford (13)	Chisel Jersey (12) Dabinett (12)	
Harper-Adams College, Newport (Shropshire)	Neverblight (10)	Cremiere (5) Eggleton Styre (5)	Medaille d'Or (5)	Barland (5) Moorcroft (5) Oldfield (10) Taynton Squash (5)
Upton Loders .. (Dorset)	Foxwhelp (5) Neverblight (5) Rouge de Treves (5)	Broadleaf (Norman 5) Court Royal (5) Cremiere (5)	Medaille d'Or (5) Virgin Mary (5) Yarlington Mill (5)	Barland (5) Butt (5) Moorcroft (5)